FLIGHT and The AIRCRAFT ENGINEER

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The Outlook

Front Line and Reserves

OUR readers, we feel sure, will need no urging to study the article which Mr. J. M. Spaight contributes to this issue on the breadth and depth of air defence. The expression "depth of defence" can be used in two senses. To station fighter squadrons close round the target to be defended, instead of round the coast, is providing depth of defence. Mr. Spaight, however, uses the term to imply large numbers of reserves, and he puts the question whether we ought not rather to provide more width of defence, i.e., more squadrons rather than more reserves.

There are not a few people in the country who are uneasy at the cessation in forming new squadrons which came upon us two years ago. Sir Kingsley Wood tells us very little about what is happening, except in terms so vague that they have almost a discouraging effect. The Prime Minister provided a grain of comfort the other day when he remarked that the Air Minister has always done more than he tells us, or words to that effect.

We may presume that Sir Kingsley, and, maybe, the whole Cabinet, wants to keep the Axis Powers guessing. That certainly must be the object of the recent expurgation of the *Air Force List*. We realise that one way of mystifying foreign nations is to increase the number of one's formations under some unfamiliar name or without publishing a name at all. It may be that some of our existing squadrons have been expanded to the strength of Wings without any indication being given in the *Air Force List*.

It is quite a good plan to mystify foreign nations, but it is also a very good plan, possibly a better plan, to give them some actual glimpses of what they would be up against in the case of war. The flight across France has obviously done good in that way, and the still longer flight which is projected, as well as the coming visit of French machines to Britain, will do more. A few more statements of fact might well be the best policy for the preservation of peace.

Absolute Altitude

JUDGING from the report by the Accidents Department on the *Calpurnia* disaster last November, it would seem that this was just one of those rare flying accidents which are unavoidable in the present state of development in navigational equipment. Its prime cause was the failure, owing to atmospherics, to receive bearings and information from the base on Lake Habbaniyah. It is reasonable to suppose, therefore, that the pilot was unable to check the millibar setting of his sensitive altimeter. This must obviously have been reading high, otherwise he would not have been flying at cruising throttle and level flight at the moment of impact.

It was, in fact, one of those extreme cases in which practically nothing could be done, though, judging from the recommendation, at the end of the report, that the wireless organisation on the Iraq sector should be improved, there seems cause for criticism. In really bad conditions, however, only ultra-short wavelengths are, we believe, entirely free from atmospheric difficulties. And even if both the ground station and the machine had had high-frequency approach equipment there might still, without an altimeter check, have been an accident.

In the meantime, there still seems to be some justification for bringing up the old idea of the landing "stick," which, in its simplest form, will give the pilot a last-minute indication of the proximity either of the ground or the water, as the case may be. Such a device was used as long ago as 1913, and yet it does not appear to have been very seriously considered at any time since, though Farnborough made some experiments a number of years ago. We have heard of pilots, making an over-water approach to an aerodrome, leaving the trailing aerial out so that the operator could feel the snatch of this aerial as it touched the water. Primitive, perhaps, and not a system which would be recommended in any but emergency conditions, but a rather more elaborate scheme might still be usefully evolved for use in cases

where all other means of absolute altitude-judging had failed. A few months ago the development of a wireless system of indicating height above the ground was announced in the United States, but not much has been heard of it since. Presumably, it will duly appear in production form.

Weasels

A SUPPLEMENTARY Estimate for the Royal Air Force was expected, and an extra £32,000 does not seem excessive. The reasons given by the Air Council for needing this sum are interesting. First comes a really comprehensive reason, namely, "various measures to augment the effectiveness of the Royal Air Force." This, of course, would cover a multitude of virtues, but the House of Commons would naturally like to know a few more details, so the second reason is the formation of more squadrons overseas, which had already been announced in Parliament. The third reason given sets one thinking. It is "the permanent manning of sections of the balloon barrage squadrons."

The balloon squadrons are part of the Auxiliary Air Force, manned by part-time officers and men who train in their spare time. Part of the personnel of the squadrons round London are being called up for continuous training, and while so embodied they will train a number of airmen of the regular R.A.F. in the management of balloons, with the result that when the A.A.F. men return to their normal existence there will be enough regulars to man a part of the London barrage permanently.

In these days it is generally thought that declarations of war will be dispensed with, and that if a nation decides to attack us it will try a surprise attack with its Air Force. If that should happen we should be able to man some of our balloons without delay, which is a comforting thought.

Consolidating a Friendship

IT is inevitable that one's imagination should be stirred by the flight in three "hops," recorded elsewhere in this issue, of the American Consolidated flying boat, from San Diego, Calif., to Felixstowe, Suff. The boat is one of several ordered by the British Air Ministry for experimental purposes, and comparisons have been made between it and such British military flying boats as the Short Sunderland. Actually, the two are not comparable, being in different classes and designed with different objects in view. The American boat has a gross weight of 27,000-28,500 lb., while the normal gross weight of the British boat is about 48,000 lb., and the normal overload weight 50,000 lb.

It is mainly in the matter of range that the two boats are compared. The maximum range of the Consolidated is stated to be slightly more than 4,000 miles. With its standard tankage the Sunderland will do about 3,000 miles. It has, however, been taken off very successfully with a vastly increased overload, and if all of that were used in the form of petrol the Sunderland would have about the same range.

The Consolidated boat is certainly very "clean," and with two engines and retractable wing tip floats it should require proportionately less power than the Short boat. A more comparable British type is the Saro Lerwick, but as this machine is still quite new it is not permissible to quote the figures for it. In order to preserve a proper sense of perspective it is necessary to bear in mind that if the Air Ministry wants maximum range British designers can provide it just as well as can American. It just so happens that no boat specification calling for it has been issued, and the American boats were, presumably, ordered because the question of long range had become important, and this was the quickest and simplest way of finding out all about it.

The Staff College

IN 1922 the Royal Air Force, then a very young Service, decided that it must have a Staff College, so one was started in some war-time huts which had been erected by German prisoners at Andover. In 1925 a decision was made that those very unworthy habitations must suffice for another ten years. Now, in 1939, the Chief of the Air Staff has just cut the first sod on the site where a really worthy Staff College building will arise. It is expected to be in full working order by 1941.

It may be said that the brains of the Air Force are located in the drawing offices of the firms, and some of them at Farnborough. If so, the heart of the Force is the Staff College. In that College are taught the doctrines whereby the machines and their human directors are converted from mere specimens of brute force, of horse-power, in fact, into thoughtfully directed instruments of defence. The man-in-the-street may not realise that both strategy and tactics are concerned in the use of air power in war. Yet nothing would be easier than for ill-considered use of that power to waste all its potentialities. The student of the Great War can find all too many instances of gallant efforts being wasted for lack of proper planning. The Air Force was then new, and its leaders were groping their way towards a sound doctrine partly by trial and error. Such mistakes must not be made again, and it is the business of the Staff College to see that throughout the Service there are numbers of officers trained in sound principles.

Forthcoming Events

JULY.

Sat., 8th-Sun., 23rd. Brussels Aero Show.
Sun., 16th-Sun., 23rd. Italian Aero Club: Littorio Rally, Rimini.
Sat., 22nd. Gosport Reunion, Brooklands.
Sat., 22nd-Tues., 25th Deauville and Plantagenet Air Rallies, France.
Tues., 25th. Alliance Française: Blériot Channel Flight 30th Anniversary Banquet, Dorchester Hotel, London.
Fri. 28th-Sun., 30th. Cannes Aero Club: Deauville-Vichy-Cannes Rally.
Sat., 29th. Civil Aviation Benevolent Fund Air Display, Redhill.
Sat., 29th-Sun., 30th. Frankfurt International Flying Meeting.

AUGUST.

Sat., 5th. Cinque Ports Flying Club: Folkestone Aero Trophy Race.
Sun., 6th. London Air Park Flying Club: Garden Party.
Sat., 12th. Eastbourne Flying Club: Flying Display and Garden Party.

SEPTEMBER.

Sat., 2nd. King's Cup Race and Wakefield Trophy Race, Birmingham.
Sun., 3rd. Gordon Bennett Balloon Race, Poland.
Sat., 16th. Cinque Ports Flying Club: Wakefield Cup Race.
Sat., 23rd. Cardiff Aeroplane Club: London-Cardiff Race.

OCTOBER.

Sun., 1st. Aero Club de France: Coupe Deutsch de la Meurthe, Etampes.
Mon., 2nd-Sun., 17th. Milan Aero Show.

AIRCRAFT of the AXIS POWERS

Recognition Drawings of Some Current Types

Dornier Do 24 flying boat (Germany). Used for reconnaissance, patrol and bombing.

FOLLOWING many requests for recognition drawings of modern military aircraft of other nations, *Flight* has prepared the set of sketches on this and the two following pages. They are to approximately the same scale and give an idea of the relative sizes and salient features of several of the current military machines of Germany and Italy.

We have also been approached for advice on the features to look for when attempting to "recognise" an aircraft in flight. This is best essayed by noting the form and position of the wings, the length of the fuselage and the number of engines, the shape of the tail and the number of vertical tail surfaces.

The drawings are self-explanatory, but it may be pointed out that the lower gun positions in the Heinkel He 111 and Junkers Ju 86K bombers may be retracted. The drawing of the Heinkel He 112U fighter has been based on the version of this machine which raised the world's landplane speed record to 463.9 m.p.h. before this was beaten by a smaller and cleaner version of the Messerschmitt, which is also illustrated, and which reached 469 m.p.h. Probably the Service Heinkel is rather larger. It is hoped to illustrate additional types in the near future.

Dornier Do 18 flying-boat (Germany). Employed for the same duties as the Do 24.

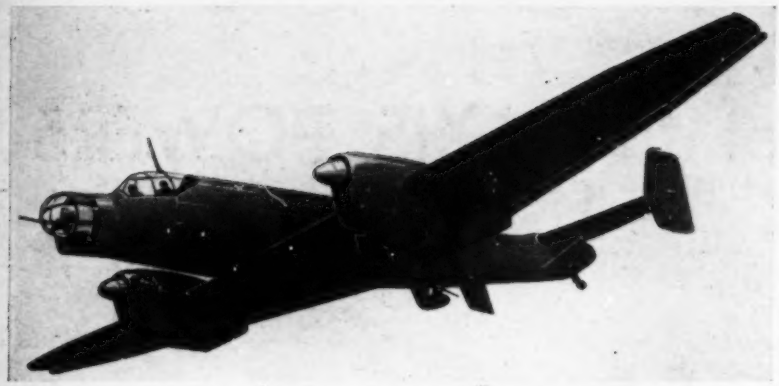
Heinkel He 111K bomber (Germany).

AIRCRAFT of the AXIS

(Continued)

A Wide Variety of Single- Tw Triple-engined Machines o Not-so-modern Co cep

("*Flight*" copyright sketch



Junkers Ju 86K bomber (Germany).

Dornier Do 17 bomber (Germany).

Junkers Ju 87 dive-bomber (Germany).

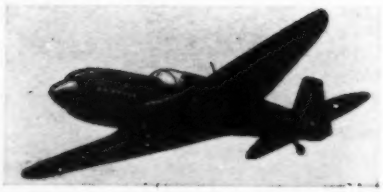
Henschel Hs 126 observation and reconnaissance machine (Germany).

Arado Ar 95 seaplane (Germany). For bombing, reconnaissance or torpedo dropping.

Messerschmitt Me 109 single-seater fighter (Germany).

(Centre above) Blohm and Voss Ha 137 single-seater dive-bomber fighter (Germany).

Henschel Hs 123 single-seater dive-bomber fighter (Germany).



(Left) Heinkel He 112U single-seater fighter (Germany).

AXIS POWERS

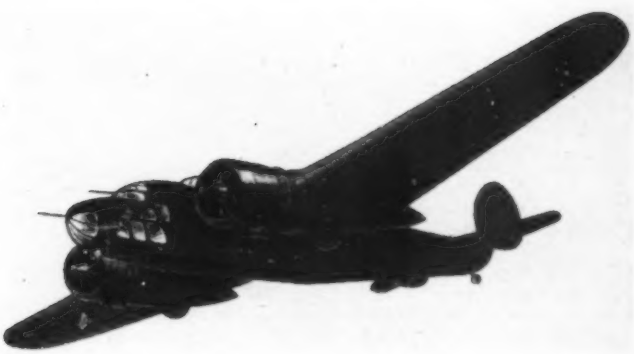
Twin- and Single-
Modern and
ception

Cant Z 506 B (Italy). A twin-float seaplane used for reconnaissance, patrol, bombing and torpedo dropping.

Fiat C.R. 32 single-seater fighter (Italy).

Savoia Marchetti S. 79 bomber (Italy).

Fiat G. 50 single-seater fighter (Italy).



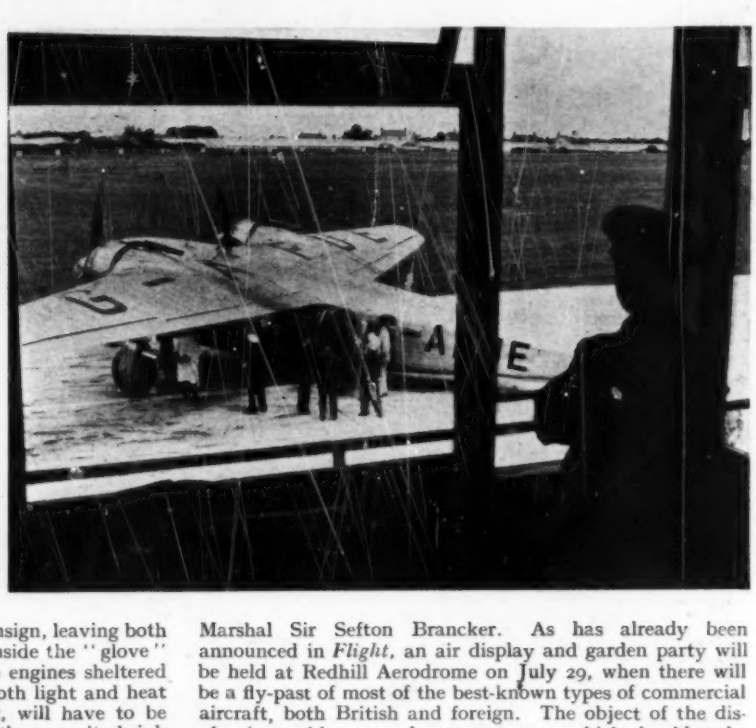
(Right) Caproni Ca 135 bomber (Italy).

Ereda 65 ground-attack machine (Italy).

(Right) Breda 88 fighter-bomber (Italy).

Drawings by "J.P."

COMMERCIAL AVIATION



FLAMINGO VISITS GUERNSEY : A courtesy call during a demonstration trip with Jersey Airways' new type.

"Flight" photograph.

THE WEEK AT CROYDON

"A. Viator" on Tailored Hangars, Ten-gallon Stetsons, and Internationality in Air Travel

IMPERIAL AIRWAYS now have five "F" and six "E" class aeroplanes, and it is a jolly sight when the majority of them are parked around the present Imperial hangar. Soon the new hangar should be in use and also the two "glove" hangars, designed to take the four engines of an Ensign, leaving both the nose and tail out in the open air. Inside the "glove" hangar men will be able to work on the engines sheltered from cold and rain and they will have both light and heat laid on. These hangars, to be efficient, will have to be a pretty close fit, and it is to be hoped they won't shrink in the night and grab hold of poor *Ettrick* (or "'At trick," as they named her after her third flight) like a giant clam laying hold of a bather.

Six Americans who flew across in the *Yankee Clipper* and later flew back to the States spent their spare time over here flying intensively around Europe in a specially chartered Sabena Savoia-Marchetti and visited eight European countries in the course of their aerial wanderings. They passed through Croydon one day last week on the way to Dublin, and the chief thrill I got from the proceedings was the sight of certain huge-brimmed white hats of the kind which I always thought existed only for film purposes. An expert on American affairs assures me that these hats are known as ten-gallon Stetsons, but a firm of old-established London hatters, who made beavers for Beau Brummell, refused to discuss the matter on the grounds that Gladstone never wore a ten-gallon hat of any kind and that the correct amount for a normal hat to hold was a quart, not more.

Capt. W. Fry has been traffic superintendent of North-Eastern Airways since the beginning of that company's operations or, at any rate, since the early days of its career. He will be missed by many of his colleagues now that he has left the operational side of commercial air transport to take up an appointment with Rollason Aircraft Services, Ltd. Capt. Fry is one of the old hands in civil aviation, previously having been with Handley Page Transport and later with Imperial Airways.

Curious jobs come to airline or special charter operators at times. Last week's plum in this way was an urgent job for Olley Air Service, necessitating the use of three Rapides to take fire-fighting apparatus to Saudi, Arabia. An oil well had somehow combusted and nobody could get near it, so Olley's took asbestos suits and shields to the Bahrein Isles, leaving Croydon on the Wednesday night and arriving on the Friday morning. The equipment was then rushed to the scene of the conflagration.

A big effort is being made to increase the Guild of Air Pilots' Benevolent Fund, founded by one whose name will never be forgotten in civil aviation, the late Air Vice-Marshal Sir Sefton Brancker. As has already been announced in *Flight*, an air display and garden party will be held at Redhill Aerodrome on July 29, when there will be a fly-past of most of the best-known types of commercial aircraft, both British and foreign. The object of the display is a noble one and one; moreover, which should make a very strong appeal to everybody who is interested in commercial aviation. Mr. F. W. Farey-Jones (Room 172, Croydon Airport), indefatigable worker in the cause of civil aviation, is hon. organiser.

Blood tests are fashionable and, incidentally, patriotic at the moment. I wonder in what group the authorities would classify the vital stream of some of our M.P.s, whose blood seems to boil at the slightest provocation or, indeed, at no real provocation at all. One M.P. sprang up recently and said it made his blood boil when British people, families of distinguished officers, flew to Paris by a line which was not British. Actually, the example seems to have been a poor one, because Paris was not the destination but another place to which there is no regular British service.

Heterogeneous

Anyway, you cannot start dragooning people in that way, and nobody's blood boils in this country when a distinguished foreigner travels on a British air route because he prefers it, or because it is more convenient or even because he cannot get a seat on the line operated by his own national company. Aviation is essentially international.

I have before me as I write a list of places from which passengers came on a single air liner the other day. It was the afternoon arrival from Holland which picks up a large number of connections before leaving Amsterdam, including the K.L.M. passengers from Australia (in conjunction with K.N.I.L.M.), Batavia, India, and so forth. On that machine there were passengers, probably of as many different nationalities from the following places: Amsterdam, Copenhagen, Katowice, Oslo, Cologne, Turku, Frankfort, Penang, Karachi, Rangoon, Alexandria, Sydney, Jodhpur and Calcutta. It is quite probable that they were flown from Amsterdam by an American pilot, for K.L.M. now has five or six, and it is certain that they were welcomed at Croydon by British K.L.M. staff; and if that is not internationalism, I'll eat my pork-pie hat.

DEBATING the B.O.A.C. BILL

Criticisms and Explanations

IN moving the second reading of the British Overseas Airways Corporation Bill last week, Sir Kingsley Wood outlined the main reasons for its introduction. He believed that the Government's proposals were the only ones which would advance British civil aviation and permit a really far-sighted policy. Among the more important advantages was that of the pooling of experience, equipment and technical resources of the two companies, British Airways and Imperial Airways. There were dangers in a monopoly, but those of competition were even worse. Competition had been tried and it failed.

The new Corporation mandate, he said, was that of securing the fullest developments consistent with economy—whereas Imperial Airways had been asked to use its best endeavours to make its services self-supporting at the earliest possible moment. Consequently, the emphasis had been laid on cheap flying rather than on aeronautical progress. Both the two chosen instruments had large and important schemes for expansion in view which required big increases in capital. It was obvious that, in the public interest, this capital should be raised and remunerated on the most economical terms. The new Corporation was accordingly allowed to borrow by the issue of Airways stock, the principal and interest being guaranteed by the Treasury. The total amount would not exceed £10,000,000, and about £7,000,000 would be issued in the first instance—£3,500,000 for the purchase of the concerns and a similar sum for immediate development, including the purchase of new machines. The annual subsidy would not exceed £4,000,000, and this would be paid until December, 1953. Previously the maximum had been £3,000,000.

The Corporation would continue the present services of the two companies, but arrangements had already been made for new services to be started in Europe, on the Trans-Tasman route, on the North Atlantic, to West Africa and across the South Atlantic. A Trans-Pacific service was also in contemplation. Until March 31, 1941, the Corporation would be paid a subsidy based on the actual deficiency in operation, but after the initial period the arrangements would be made for three-year periods in order to give the Corporation a good chance of planning ahead.

Encouraging Efficiency

An important provision was that which enabled the Corporation to place to the credit of its own general reserve account any excesses of revenue achieved as a result of efficient administration. The resulting fund would be at the disposal of the management, and would provide a stimulus for efficiency and progress. With regard to the prices paid for the two undertakings, Sir Kingsley said that these had been agreed to after protracted negotiations, with the advice of the Treasury and after a careful and detailed investigation. The Government believed them to be fair and reasonable. He pointed out, too, that the development of the two companies had been undertaken by the shareholders at their own risk, and stressed the fact that subsidies were paid for services performed and were not loans or temporary grants.

Sir Kingsley then went on to explain the composition of the new Corporation, which was given in *Flight* of June 15, and added that the most important need at the moment was for new machine types. Accordingly, earlier this year he had appointed a small committee to advise him on the best method of encouraging civil aircraft development. In the past, three methods had been tried, that of leaving the initiative to the industry, to the operating company, and to the Air Ministry. None of these methods had succeeded. Consequent on the recommendations of the Brown Committee, a permanent Civil Aviation Development Committee would shortly be set up. Its function would be to co-ordinate the needs of airline operators so that construction might be concentrated on a relatively few types. The committee would be independent of the Air Ministry, but would work through the staff of the recently formed Directorate of Civil Research and Production.

Obviously a great deal would depend on the co-operation of the airline companies, and he considered that endorsement by the Committee would normally be essential for any project requiring public assistance. The Government had also accepted the recommendation that civil types should, where practicable, be used by the R.A.F., and, following this policy, an order had recently been placed for a certain number of D.H. Flamingos. So far as research and development work was concerned, it was primarily the obligation of the manufacturing and operating industry to finance this work.

During the debate Mr. Lees-Smith was critical of the proposed Corporation and moved an amendment rejecting the Bill. He said that it would be more like a branch of the Air Ministry, but not subject to the same control. He alleged, too, that some £600,000 more was being paid to the shareholders of Imperial Airways than actually needed to be paid.

Paying for Prestige

Supporting the Bill, Lt. Col. Moore-Brabazon said that at last we were going to see a divergence between civil and military aviation. Every British machine flying abroad was helping our prestige, and it was necessary that these machines should be the finest available. The Marquess of Clydesdale had certain doubts about the Bill and cited the case of the private American airlines which, he said, were the most efficient in the world. He said, too, that there appeared to be a real danger that the Corporation would interfere with internal airlines. Sir E. Grigg, in support of the Bill, was glad to learn that representatives of the Dominions and Colonies would be on the board of the Corporation, but he thought that too much power was being given to the Secretary of State for Air. Mr. Perkins' remarks can best be summarised by his opening statement, in which he said that the present situation in civil aviation was so bad that any change would be better than no change.

In his reply to criticisms, Capt. Balfour, the Under Secretary of State for Air, explained the details of the "fair-price" arrangements, proving that there could have been no manipulation or any appreciable buying or selling of shares. Wishing to assure both himself and the Government that the price paid to British Airways was correct, three independent gentlemen had been asked to examine the final offer.

The Corporation had power to run internal airlines, but only subject to the specific permission and support of the Secretary of State for Air. It was necessary for the Corporation to have wide powers which it might never use. The Government particularly wanted the Corporation to be a live body and not "a home for retired gentlemen." When we had got through the difficult initial period, he was convinced our civil aviation would lead that of the world, though it would take two or three years yet to remedy the present situation.

The "Calpurnia" Accident

EXTREMELY difficult weather conditions have been given by the Air Ministry Accidents Department as the prime cause for the disaster to the Short *Calpurnia*, which was wrecked on Lake Habbaniyah last November. It appears that bearings and other messages sent to the machine between 3.19 p.m. and 3.34 p.m. were, because of atmospherics, not received, and the captain, who lost his life, came down very low in the darkness and bad weather in order to fix his position by ground observation.

During this period he failed fully to realise how dangerously low he was, and the machine struck the water with the engines running at full power. The Chief Inspector of Accidents advises an improvement in the radio organisation on this particular sector, and proposals for the modification of the control organisation are now being considered by the Iraq Government.

Supercharging the Stratoliner

ON June 20, Mr. E. T. Allen took the Boeing Stratoliner up on its first test flight with the cabin supercharging equipment in action. Pressure was held at the equivalent of that at 9,000ft. up to an altitude of 16,500ft., and apparently everything went well. In the Stratoliner the altitude pressure system consists of mechanical blowers which increase the pressure of the air as it enters the machine's ventilating system; automatic control valves are used for regulation, and two entirely independent supercharging and regulating systems are fitted, either one of which is capable of doing all the necessary work.

One advantage of pressurisation which is not usually mentioned is that it enables very much more rapid descents to be made without causing trouble to the passengers. On this particular flight the descent from 16,500ft. to 6,000ft. was made at the rate of 600 ft/min.

Commercial Aviation

Our Own

WHILE the regular Pan-American Airways' Atlantic Services continue to be so regular that they are no longer worth recording, it has been unofficially announced that our own services will start on August 5. They will be weekly and will, for the present, carry mail only.

The first modified "C"-class boat will leave Foynes on August 5, while a service in the reverse direction will leave New York for Montreal on August 9. The Harrow tankers should already be at Shannon Airport and Hattie's Camp, Newfoundland. Either *Cabot* or *Caribou* will start the service, since *Connemara* was burnt out at Hythe a few weeks ago—unfortunately enough, just before her engine endurance and consumption tests had been completed.

On July 15 the old *Lieutenant* reached Biscarosse, Bordeaux, after its first non-stop Atlantic flight—made in 28 hr. 27 min. from New York, and remarkable, too, because all but 200 miles of the journey was made on five of the six engines. The pilot was M. Guillaumet, and M. Couhé, managing director of Air France Transatlantique, was among those on board.

More Scandinavian Extensions

THE Finnish company, Aero O/Y, has recently opened a new service from Helsinki to Kemi, the schedule time for the Helsinki-Tammerfors-Vasa-Uleaborg-Kemi run being 4½ hours. By the summer of 1940 it is hoped to have the line extended farther north, via Rovaniemi and Ivalo, to Petsamo, and from that time the name of the service will be Arctic Air Express. Incidentally, a new airport was opened recently at Kemi. On July 1 another daily schedule was added on the Stockholm-Helsinki run, since K.L.M./A.B.A.'s Scandinavian Air Express has been extended beyond Stockholm.

Several Scandinavian newspapers published statements recently to the effect that A.B.A. was negotiating with Aeroflot for the joint operation of a Far East service from Stockholm, via Moscow, to Vladivostok. This route would be about 2,500 miles shorter than the present services through India, and it is believed that Japanese authorities would not object to the scheme if it was carried out by a neutral country. The news has neither been denied nor confirmed.

A Point About Altimeter Correction

EARLY this year a new specification for altimeters used on civil aircraft was issued. For the benefit of those concerned, Kelvin Bottomley and Baird have explained the changes which will result from this alteration, especially in relation to altimeter computors.

In the past the majority of altimeters, apart from those of the sensitive type, have been calibrated in accordance with the Isothermal Convention, which is based on the assumption that the atmospheric temperature is a uniform +10° C. at any altitude. Such an assumption is obviously false, and true height can be obtained from such altimeters only by applying a correction, and several computors have been designed to eliminate the work involved.

The new specification calls for altimeters to be calibrated in accordance with a more recent convention agreed upon by the I.C.A.N. This is based upon a very large number of meteorological observations and is, therefore, much closer to atmospheric conditions, especially in the matter of change of temperature with altitude. The I.C.A.N. assumes that the lapse rate, or rate of change of temperature with altitude, is approximately 2° C. per 1,000ft., this figure being very close to the average lapse rate throughout the world; temperature at sea level is assumed to be +15° C. Altimeters calibrated according to the I.C.A.N. Convention give readings which are much more accurate under normal conditions, and the corrections necessary in many cases are no more than those due to instrumental errors.

Obviously, therefore, computors designed for use with altimeters calibrated to the Isothermal Convention cannot be used to correct the readings of instruments calibrated to the I.C.A.N. Convention, and vice versa. Computors do not always show any indication of the Convention adopted in their construction, and it will be of interest to pilots to know of a simple method of discovering whether or not a computor is designed for use with I.C.A.N. calibrated altimeters.

A very common form of computor consists of an inner height scale reading against a temperature scale, and an outer pair of scales marked "indicated" and "true" height respectively. In a computor for use with Isothermal instruments, the indicated and true height scales coincide at any given height when that height is set on the inner scale opposite a temperature of +10° C. In an I.C.A.N. computor, the indicated and true height scales will coincide at every height if zero height is set against +15° C., or if, say, 20,000ft. is set against −25° C. in accordance with the assumed lapse rate of 2° C. per 1,000ft. previously mentioned. Up to 6,000ft. the differences between the readings of altimeters calibrated to the two Conventions do not exceed 30ft. Above 6,000ft. there is an increasing divergence amounting to as much as 1,000ft. at 20,000ft., the Isothermal instrument always indicating a greater height than the I.C.A.N. instrument at the same atmospheric pressure. Where there is no indication on the altimeter to which Convention it has been calibrated, it is, of course, safer therefore to assume that the Isothermal Convention has been adopted, and that a correction should be applied.

Very few sensitive altimeters have been calibrated in accordance with the Isothermal Convention, and in general it is safe to assume with these instruments that an I.C.A.N. computor should be used.

The New Zealand Base

THE administration building and workshops for use by Tasman Empire Airways have now been completed at Mechanic's Bay, Auckland, New Zealand, and it is expected that the trans-Tasman service will be started on or about October 1.

At the same time Pan-American Airways have built their own terminal next door. The base is about a mile from the centre of the city itself. It will be remembered that the P.A.A. experimental flights to New Zealand were interrupted in January last year when the Sikorsky S.42B, *Samoan Clipper*, was lost. Boeing 314s will be used for the new service, and one of them has been named *South Seas Clipper* in anticipation. Both T.E.A. and P.A.A. will use the same stretch of water in Waitemata Harbour.

Full-scale Training

FOLLOWING *Flight's* remarks in the issue of June 29 about the necessity for more thorough training for flying-boat pilots, it is interesting to learn that *Maia*, the lower component of the Composite, is to be used exclusively for training purposes by Imperial Airways. This machine, which is a specially modified version of the "C" class boat, is now at the disposal of Imperial Airways' school at Hythe, and will be used not only for flying training, but also for navigational training, since all the Imperial captains are expected to obtain their First-class Navigators' certificate. Special equipment is being installed in *Maia*, which will still, however, be available as the lower component of the Composite when required, as well as being used as a flying test-bench for new instruments and equipment.

Incidentally, Mr. J. W. S. Brancker has recently been appointed as Imperial Airways' area manager for India and Burma. Mr. Brancker, who is the son of the late Air Vice Marshal Sir Sefton Brancker, has been manager of the European services since 1937, and was previously manager of the Central African area.

Alternative Difficulties

IT appears that borings made during the past month on the site of the proposed alternative airport for Glasgow have been so unsatisfactory that this elaborate "four-in-one" £100,000 scheme is now threatened with an inglorious k.o. from Mother Nature. Persistent tests in the vicinity of the R.A.F. station at Abbotsinch have told the same story. Boring shafts have delved deep into the ground, and always they have brought up the same foundation "sample"—dank brown sections of peat. Engineers report peat to a considerable depth, and difficulty in striking a rock bottom at any point. Tests, however, have not yet been concluded. Additional borings are to be made, and Air Ministry officials are expected to visit Glasgow in connection with the proposed scheme at an early date.

The ground in the vicinity of Abbotsinch is attractive to the inquiring eye. It has a green and gloriously flat appearance, and only the most pessimistic would have believed that beneath this inviting surface lay a squelching bog. It seems, indeed, that the experts took just one look, prepared their plans for a large extension of the existing aerodrome to provide for R.A.F.V.R. training, civil training, and air transport, and proceeded with test bores as a matter of course. Fortunately, the red tape system demands such precautions. There is a distinct difference, of course, between water and bog. While water can be drained, bog—if it goes down to any great depth—defies conditioning.

The Flamingo outside the impressive Jersey terminal building.

"Flight" photograph.

THE FLAMINGO in SERVICE

Prototype D.H.95 in Use with Jersey and Guernsey Airways : Some Passenger Impressions of the Type

SOON after the prototype D.H.95, or Flamingo, made its first flights it was rumoured that Jersey Airways, apart from other operating companies, were particularly interested in the type. Nevertheless, in view of the early and considerable Government orders that have been placed for the machine, it is pleasantly surprising to find that this company is, in fact, the first to put the Flamingo into service. It may be imagined that Jersey Airways' interest in the machine was shown at a very early date and, in any case, the manufacturers would be right in endeavouring to have the type in regular use as a passenger carrier as soon as possible.

Recently the prototype has been in "test" use for the carriage of mails between Southampton and Jersey, and it is now due to go into regular week-end passenger service on the direct London and Southampton runs. After experience with a single machine during this summer season, Jersey Airways will probably place an order for several specialised versions. The prototype has a standard capacity of twelve passengers, but the Jersey machines will carry eighteen and there will be certain minor modifications, too, in the control cabin layout. Only in serious airline work can various minor layout points be settled, and it is significant, particularly following *Flight's* remarks from time to time, that Mr. G. de Havilland, the D.H. chief test pilot, has been assisting on the mail runs.

Quiet and Smooth

Previously, I had flown in the Flamingo before it had either its soundproofing or furnishing, on one of the earlier test flights, and only last week did I have a chance of trying it in finished form. It certainly is as quiet as, and probably quieter than, any other machine of its class, and sheer smoothness of travel is helped very considerably by the fact that it is normally flown at a good deal less than 60 per cent. full power. More important from the operator's point of view is the ample power reserve which this fact implies. Quite apart from single-engined performance, this means, with constant-speed airscrews, that the take-off is very short indeed and will enable the machine to be used on routes where the aerodromes are comparatively small. A steep approach and short landing largely depend on piloting skill, but a good take-off and initial rate of climb can only, so to speak, be designed into the machine, and these are, to-day, more important than ever. Some 25 degrees of flap are used for the take-off of the Flamingo and the lateral stability and control is such that it can safely be made to fly as soon as it has reached its minimum flying speed. Last Friday the wind conditions were such that the shortest runs both at the new Guernsey Airport and at Jersey had to be used by Capt. Caldwell, who was in charge, but the Flamingo, carrying about two-thirds full load, was at 200 feet or more when crossing each boundary. The runs used on this day were about 700 yards. Another good point in small-aerodrome operation is that the brakes can safely be applied really hard as soon as the machine is properly down—or even before.

From the passengers' point of view, the high-wing layout is very much appreciated. It seems to be years since passengers in transport aeroplanes had anything to look at except a vast expanse of shimmering metal wing. Admittedly, at present-day cruising heights there is not much to be seen in any case, but passengers do like to be able to see directly downwards. Another little feature of the high-wing arrangement is that the cabin is very much cooler. Incidentally, except at the point where the main spar crosses the fuselage, the cabin is not only very high but wide, and almost from end to end anybody less than 6ft. 7in. in height can walk comfortably. Entry, too, does not demand gymnastics on a wobbling, mobile step-ladder.

Both on the way to Jersey via Guernsey and during the return journey, the Flamingo was being generally flown at about 52 per cent. full power—or 460 h.p. from each engine. On the outward journey Alderney was reached, against a 20 m.p.h. head wind, in two minutes less than an hour, giving an average speed of 167 m.p.h., while the entire run from Jersey to Heston was afterwards made in 52 minutes, an average of 226 m.p.h. The ground speed thus averaged out at 196 m.p.h. for the two journeys, made at very little more than half the available power. Whilst the prototype has normal constant-speed airscrews the later production machines will have De Havilland Hydromatics, with a consequent improvement in the already good single-engined performance figures and an increase in the maximum possible all-up weight.

It will be remembered that at one stage during the development of the prototype a third, central fin was fitted in order to improve the machine's directional stability. Later on it was discovered that the slight instability was due to the effects of the particular airflow "pattern" behind each nacelle. A "smoother" ring has now been fitted round the rear of each nacelle and the machine has returned to its much more æsthetically pleasing two-rudder layout. Its "smoothers" consist of semi-circular metal strips supported about three inches away from the nacelle extension.

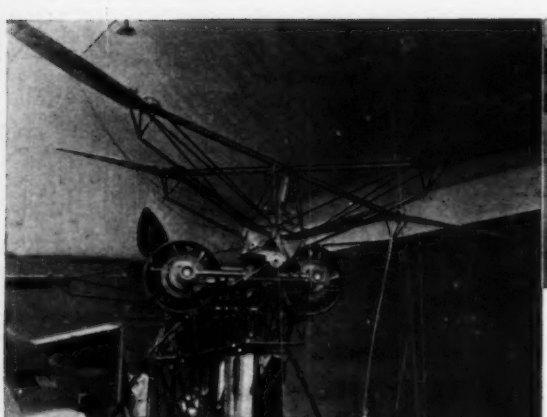
One incidental result of the short visit to Guernsey on the way to Jersey was to learn that, though the airport has only been in use since the beginning of May, the traffic figures are already climbing up towards those at Jersey. In 70 days something like 5,000 passengers have been carried to and from the Island and, in all, there had been 1,663 machine arrivals between May 6 and July 14. Obviously these island services are being properly used and, though the run is a comparatively short one for a high-efficiency type like the D.H.95, its speed should be a special inducement to passengers.

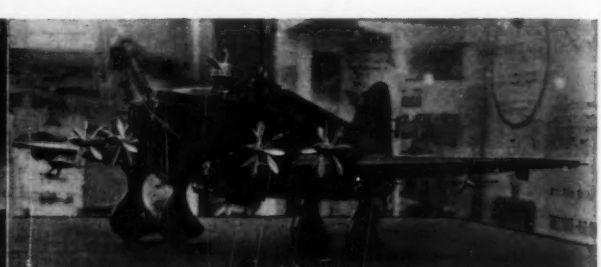
H. A. T.

Another Atlantic Survey

THE special Consolidated PBY flying-boat, *Transatlantic*, piloted by Capt. Patrick Byrne, made a survey flight across the Atlantic from Port Botwood to Foynes for American Export Air Lines, last week—arriving at Foynes, on Saturday, July 15, after taking approximately twenty hours for the trip from New York. The machine left New York on Friday morning and reached Botwood in seven hours; it took off again for Foynes after a forty-minute stop for refuelling.

Capt. Byrne, who was accompanied by a crew of four, explained at Foynes that the flight was in the nature of a survey for his company, and the establishment of a regular Transatlantic service by American Export depended on whether mail-carrying contracts were forthcoming.





REVOLUTION AND POSSIBLE EVOLUTION: Two "side-shows" at the Brussels Show. On the left is a (slightly!) developed version of the Florinne helicopter, which at one time held the world's record for such craft. The second curiosity is a representation of a gargantuan aerial battleship with everything except an admiral's sternwalk.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

C.A.G. TRAINING

Association and Local Committees Suggested

CONTACT with the Air Defence Cadet Corps has greatly impressed me with the amount of voluntary training and help which can be obtained in aviation by those who make the effort to foster the advancement of a body of this kind, and it occurs to me, as a Civil Air Guard, that members of the Civil Air Guard could do much in this way themselves. We have the advantage, unlike the A.D.C.C., which was begun entirely by voluntary effort, of having our organisation already formed for us.

The Air Defence Cadets, through the efforts of local committees, have obtained headquarters for local units, together with courses of instruction, lectures and visits to R.A.F. stations, while the central committee has obtained Government help and raised financial support for wider schemes, such as summer gliding camps. I suggest that local committees should be formed among C.A.G.s at different aerodromes, and that a central association, upon which local committees could be represented, should be formed to put forward collectively the views and needs of the C.A.G. personnel.

Many C.A.G.s must feel that learning to fly is not sufficient alone, and must wish to learn more about navigation, meteorology, wireless, practical engineering, and many other subjects to do with aviation. The National Women's Air Reserve is already operating successfully such a scheme, started before they linked up with the C.A.G. for flying training.

The organisation I suggest need not be limited to men, however, but could represent all C.A.G.s. It should not be difficult to obtain the use of a room at one of the London area aerodromes used by C.A.G.s, for use as an office for the central association. I don't think it need be imagined that if we help ourselves the Government will not think it so necessary to give us their aid, but rather the reverse. In any case, the efforts of the local committees and central association suggested would be chiefly concerned with advancing ground training facilities.

Anyone interested in forming an association from the national standpoint might, perhaps, care to exchange views with me (c/o 23 (c) Kew Gardens Road, Kew Gardens, Surrey), or through your correspondence columns? DENIS HORNSEY.

SAILPLANING AND POWER FLYING

More about Eric Collins

I READ with interest the remarks in recent correspondence pages about sailplaning and solo times. The mention of the late Eric Collins by Mr. Milne is especially interesting, as I had the pleasure of knowing Collins very well. I was present when a German pilot who was visiting this country in a Klemm asked him to fly it—knowing that Collins had never flown an aeroplane before. The owner of the Klemm was himself a sailplane pilot and could consequently judge the likelihood of his machine staying in one piece in Collins' hands—rather better than simply an aeroplane pilot, who is always a trifle jealous of his art. Collins refused, however, which was a pity.

It is interesting to note that sailplane pilots, being by nature opportunists, have joined the C.A.G. with alacrity. The solo times have, in all the cases I know of, brought joy to the hearts of the aeroplane clubs concerned.

Personal reaction to aeroplaning, after some years' sail-flying, leads me increasingly to wonder how on earth an *ab initio* C.A.G. can possibly survive, after only eight or so hours' nursing in the air. Yet a lot of them do!

Portsmouth. J. S. SPROULE.

THE CIVIL AIR BENEVOLENT FUND

An Appeal for Support—and Some Details of the Redhill Display

YOUR readers will have read quite a deal recently about the Civil Air Benevolent Fund and the various people who have been doing their utmost in their spare time to further this cause. Already many thousand pounds have been subscribed, and the money is still coming in. May I say to all who read this letter: "Do not let this good news deter you from sending in *your* donation." As a matter of fact, we should like to see more representation of the pilots themselves, about whom all this Fund turns. It is not inferred in any way that they are not doing their part, but a large lump donation from them would be a grand heading to the list. Come forward you fellows, Army Co-op, airline and instructors all!

By the way, here is more about the Redhill Flying show on July 29, in aid of the Fund. A Hurricane is doing its "stuff," as is the direct take-off Autogiro. A short pylon race will take place between three Tipsies, and Philip Wills is demonstrating the Minimoa sailplane from a winch launch on the aerodrome. The show starts at 2.30, so come early, as the roads leading to the aerodrome are on the small side. The public are requested to take the specially signposted routes as they have been carefully selected to by-pass heavy traffic and get you there in the shortest time. H. SADLER-WHITAKER.

Redhill.

[Donations should be sent to the hon. organiser, Mr. F. W. Farey-Jones, F.R.S.A., Room 172, Airport of London, Croydon, cheques being made payable to the G.A.P.A.N. Benevolent Fund and crossed "A/c Payee Only."—ED.]

STORMY WEATHER

C.A.G. Sensibilities Offended?

WHY the nasty crack at the C.A.G. aspirants on page 2 of your issue of July 6, contained in the storm-cloud picture headed "Electric"? It is quite uncalled for.

By the look of two or three R.A.F. stations, including the C.F.S., in this district on Tuesday, July 4, the majority of R.A.F. "aspirants" (what an awful word) were also on the ground. K. W. BIRT.

Devizes.

[Our caption said: "Last week, meteorologically speaking, was one of cold, warm and lukewarm fronts, tendencies to local thunder, and other such odd mixtures of the kind which keep C.A.G. aspirants on the ground and raise sailplane pilots to new altitude records." It was, in effect, a comment on a recently published letter from an instructor who complained that C.A.G. pupils were kept on the ground unnecessarily. The dictionary, incidentally, tells us that an aspirant is "one who aspires or seeks with eagerness; a candidate."—ED.]

TOPICS of the DAY

This Corporation

WHATEVER the rights and wrongs of the new British Overseas Airways Corporation (BOAC to the more polite and B.O. Airways to the less), its formation will certainly offer a big chance for the testing out of ever-failing human nature. When we were very young we believed so whole-heartedly in an all-for-all system in commerce and industry; we believed that everyone, left alone, would work very hard and very honestly without the need for wasteful competition. Unfortunately for such ideals, we find as we grow older that a very large number of people are prepared to do just as little work as possible for the greatest possible gain in cash.

The success of the B.O.A.C. depends entirely on the energy and honesty of the people in control. If the necessary Bill goes through without serious modification the Corporation will stand quite alone—though, I hope, will not be above criticism. It can be done. The Post Office and, in a less marked degree, the London Passenger Transport Board have shown that a monopoly need not necessarily be inefficient, though there is an awful temptation for people to sit back and let things slide. When the upper strata in the staff starts to arrive at 10 a.m., leave for a quiet coffee at 11 a.m., take two hours for lunch, and depart in order to catch a train to the country at 5.22 p.m.—then the whole lot will have fallen by the wayside.

One thing the new Corporation *can* do, and that is to make every effort to return to ordinary people the confidence which they have tended to lose during the last few years. Confidence not so much in the safety of air travel—goodness knows the newspapers (all unwittingly in their demand for sensational news) have done their best to make flying appear to be quite the most dangerous means of travel—but in the honesty and efficiency of the concern itself. The great British public, whether prospective air travellers or not, are paying through the nose to keep up this big international air transport company, and they will expect results. Results, too, that are obtained with the least unnecessary expenditure. A splendiferous terminal building means a lot to the traveller, but nothing much to the taxpayer.

One small but important way in which such confidence could be helped is in being really outspoken about the accidents and the minor mishaps which occur from time to time. For years the general public, and particularly the flying public, have had reason to feel that the airline companies are always trying to keep something back about accidents, and that there has been some deep, mysterious, and somewhat skeleton-in-the-cupboard reason behind nearly every one of them.

We have grown quite used to the idea of waiting for six months or more for the mills of the Air Ministry Accidents Department to grind slowly, but by no means exceeding small, and presumably Imperial Airways have not always been in a position to say very much about any particular accident until this Department's findings had been published. But the new Corporation should be strong enough to be able to take matters into its own hands, and to be perfectly outspoken about every occurrence which might breed doubt.

No one will expect an airline company to issue complete and, perhaps, damning details of a particular accident, when their own findings may quite easily be reversed by those of the official investigation, but it should be quite easy to give the public the idea that everything possible is being said and, for that matter, done to prevent a repetition of the catastrophe. It should not be the duty of an airline publicity chief to deny all knowledge of a particularly unfortunate occurrence, but rather to say as much as possible and leave it to the purveyors of news to use their own judgment.

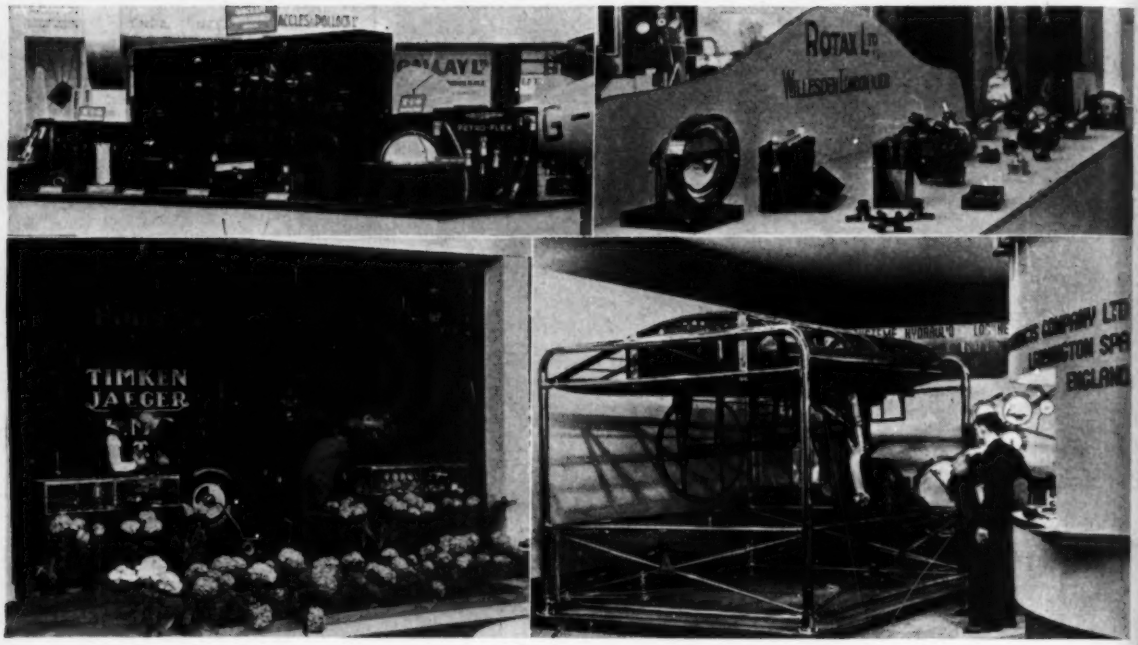
Pilot Shortage

SOME time ago I suggested that one way in which the experience of a great many of the older "A" licensed pilots might be utilised in the Civil Air Guard was that of assisting in Army Co-operation flying. At the time there was a tremendous shortage of civil pilots; now it is even more acute. By way of a start, permission is now being given in certain cases for "A" licensed pilots to do this work, though all "B" licensed pilots must first be notified in case any one of them would care to take the job.

Probably it will all work very well indeed, but there is always the risk that unscrupulous employers will take advantage of the comparative ignorance of some "A" licensees and encourage them to fly, by night, in unsuitable weather and/or machines. Quite a lot of this Army Co-operation flying at night is carried out with single-engined radio-less machines, and the importance of treating weather forecasts with real seriousness is considerable. It is all right during the summer months when, by flying on one-eighth throttle, the machines can, if necessary, sit in the air until dawn, but I should certainly hate to find myself flying over a suddenly fog-bound landscape in the middle of the night, knowing perfectly well that I had to come down some time and knowing, at the same time, most imperfectly where I was. Luckily the sort of fog which appears in the middle of the night is usually quite thin and airport beacons can usually be seen through it. At the worst, it is usually possible to do some kind of semi-stalled engine-on landing.

Incidentally, the growing need for instructors is even greater than that for pilots in other lines of business, and just now there must be hundreds of "A" licensed pilots taking either assistant instructors' or full instructors' courses. All very nice for the moment, when any number of really good jobs can be obtained, but goodness knows what will happen when and if the international situation ever clarifies itself. Most of these young men would hate sitting in offices, even if office work was available, and the airline companies will only be able to take a very small proportion of them. We shall see. For the moment there is no sign of any diminution in the demand for pilots.

INDICATOR.



At the top are seen the demonstration panel of Smith's Instruments and a range of Rotax accessories ; below them are a combined stand representing the Hobson, Timken and Jaeger continental organisation ; on the right is a retractable undercarriage demonstration rig by the Automotive Products Co., Ltd.

EQUIPMENT at the BRUSSELS SHOW

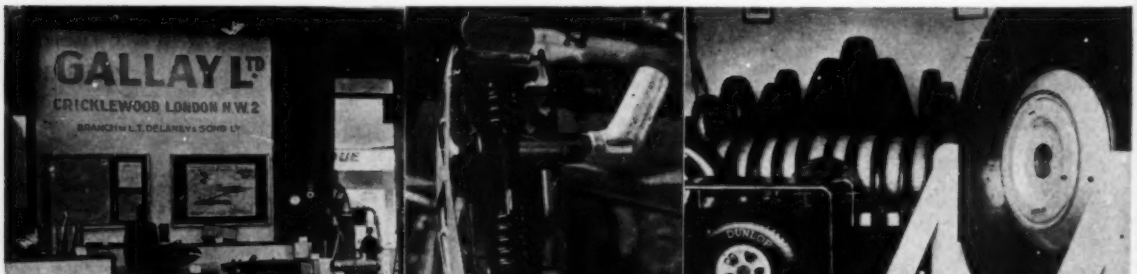
LAST week we dealt in some detail with the aircraft and engine exhibits at the Brussels Aero Show, which continues until July 23 On these two pages are illustrated a number of the British engine and accessory exhibits, while the brief notes which follow form a commentary on certain of the more noteworthy contributions from various nationalities. An outstanding impression gained by the visitor is the very convincing show which the British industry is putting up in the face of heavy competition and specialisation by numerous Continental firms.

On the main Air Ministry stand and around the sidewalks a large number of British material and component manufacturers are represented, while several others have their products on the stands of agents. Typical of German organisation, the ancillary exhibits from the Reich are marshalled in one section under central control and staffed by white-overalled demonstrators. Certainly the German industry is as well represented as at any previous exhibition.

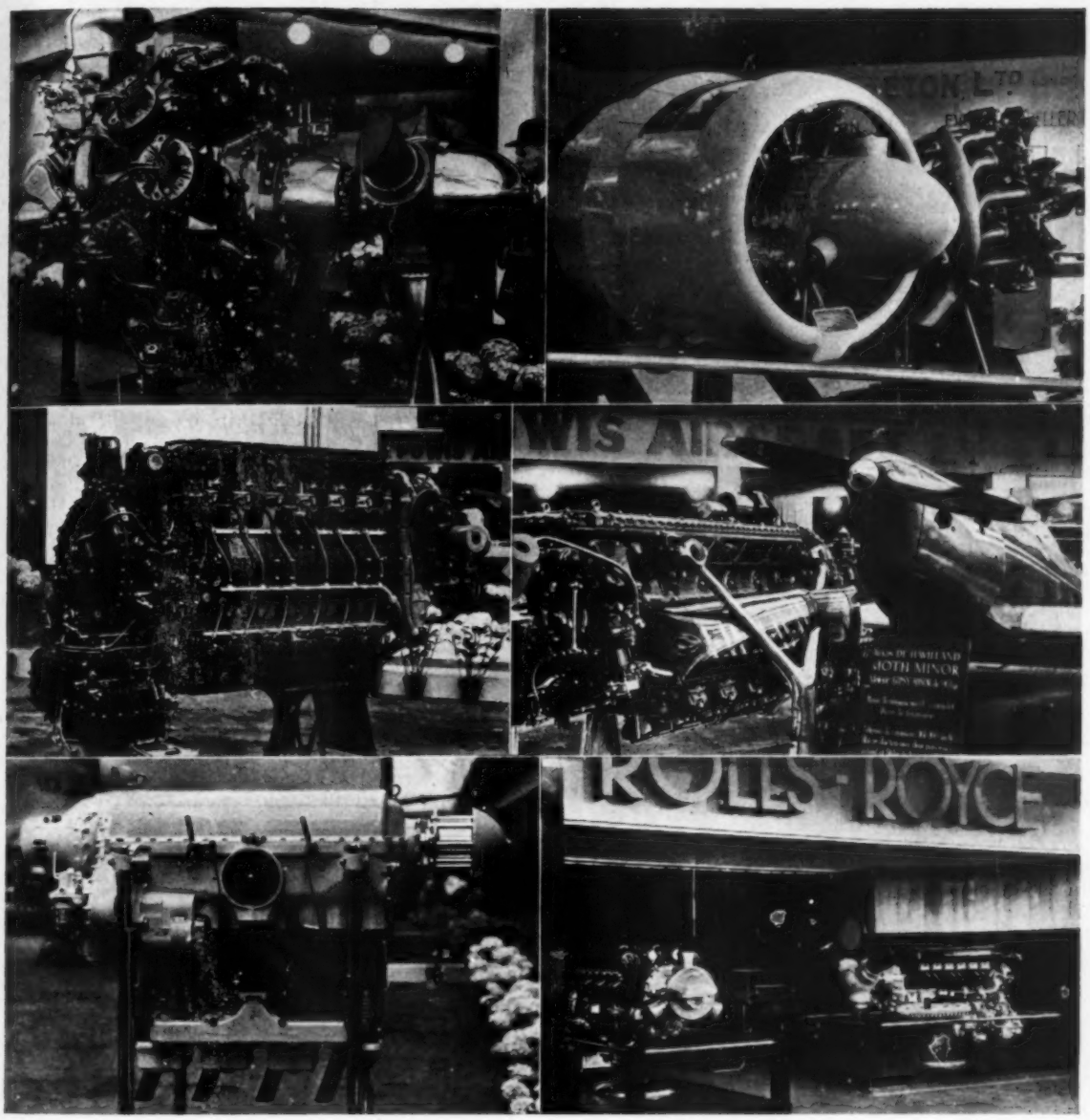
Of the finished components, airscrews seem to be attracting quite extraordinary attention. De Havilland constant-speed and hydromatic types and a sectioned working model of the small D.H. "1,000" size v.p. airscrew are among the "all-metals," while Jablo blades, both finished and partially stripped, show some of the possibilities in the non-metallic field. French electrically operated airscrews are shown in all their detail on the Ratier stand, and the Junkers constant-speed model, for engines of about 1,200 h.p., has reinforced wooden blades. Argus have a "fan-operated" airscrew for their inverted 12-cylinder engine. Among some ten other makes are those of Gnôme-Rhône and Hispano-Suiza, of Letov (Czechoslovakia) and Escher Wyss (Switzerland), and the unique single-bladed Everel airscrew handled by W. S. Shackleton, Ltd.

The Wyss design, incidentally, is an exceptionally neat fully feathering constant-speed airscrew suitable for engines of about 1,000 h.p. The hub shape closely resembles that of the Rotol airscrew, and the blades are of light alloy. The control is automatic or from the pilot's cockpit, and the operation is through a high-pressure hydraulic servo motor.

Raw materials and part-finished components are of considerable interest, Germany, in particular, showing examples of castings, pressings and forgings in a number of light alloys. High Duty Alloys, Ltd., who produce forgings, castings, etc., for almost every country, are truly international exhibitors. Steel tubing and manipulated



Left to right : cooling and heating equipment on the Gallay stand ; a Dowty internally sprung wheel in section ; and Dunlop tyres of contrasting sizes.



British power : reading downwards from left to right are the Bristol Taurus engine, the Alvis Leonides, Napier Halford, Dagger VIII, De Havilland Gipsy Twelve (with the Moth Minor in the background), Cirrus Major, and Rolls Royce Merlin III and Merlin X (Rotol airscrews)—the last named shown with sectioned blower.

tubular parts of a very high standard are the work of Accles and Pollock.

Most of the instruments and accessories are familiar in many countries, bearing such names as Smith, Rotax, Short and Mason, and Reid and Sigrist. It is significant that these companies find it worth while to exhibit their products abroad in the face of keen international competition. Wheels, brakes and hydraulic equipment, particularly for large modern airliners, can, according to their efficiency, influence to a considerable extent the reception given to a new aircraft. Argus demonstrate the efficiency of their braking system with a working mock-up reproducing operational conditions. Automotive Products go further by retracting their Avery wheels and brakes on a mock-up undercarriage mounting. Dunlop show how efficiently modern aircraft, no matter what their size, can be "shod."

Almost every aircraft-producing country has different ideas about cooling and the position, size, shape of inlet and outlet of radiators and coolers, and the materials used are probably more diverse than for any other component. At Brussels are oil coolers disposed round radial cowls in segments, and others as a part of the leading edge. Machines carry mid-ventral radiators in long ducts or have no apparent radiator at all! Gallay, Ltd., have a compact oil tank and cooler as fitted to the Oxford, which, by means of a valve, provides automatically for minimum circulation while the oil is cold. Being made as a unit, all interconnections between tank and cooler are eliminated. More information is also available concerning the latest Gallay aerodynamic cooling for which the radiator is carried in a very long, shallow duct. No less important than air for cooling is (especially in the East) clean air for induction, and Vokes, Ltd., show some interesting new designs of intake filters, as well as oil filters.

The most prominent armament exhibit is the American Armament Corporation's short-barrelled 37 mm. gun in charge of Sterling Metals, Ltd., on the Shackleton stand. The turret in which the weapon is mounted works smoothly and easily but hardly fast enough for modern aerial fighting, so a power-driven model has been developed, though this is not exhibited.

Camouflage is—to use a possibly inaccurate simile—very much in the public eye, and Cellon, Ltd., are showing how they can provide finishes to satisfy any international inclination.

The size of *Golden Hind* is such as to dwarf the four big Bristol Hercules engines. The wing-tip floats are set proportionately farther out towards the tips than on earlier types.

Construction of the New Short "G" Class Described : Three 32-Tonners on Order for Imperial Airways

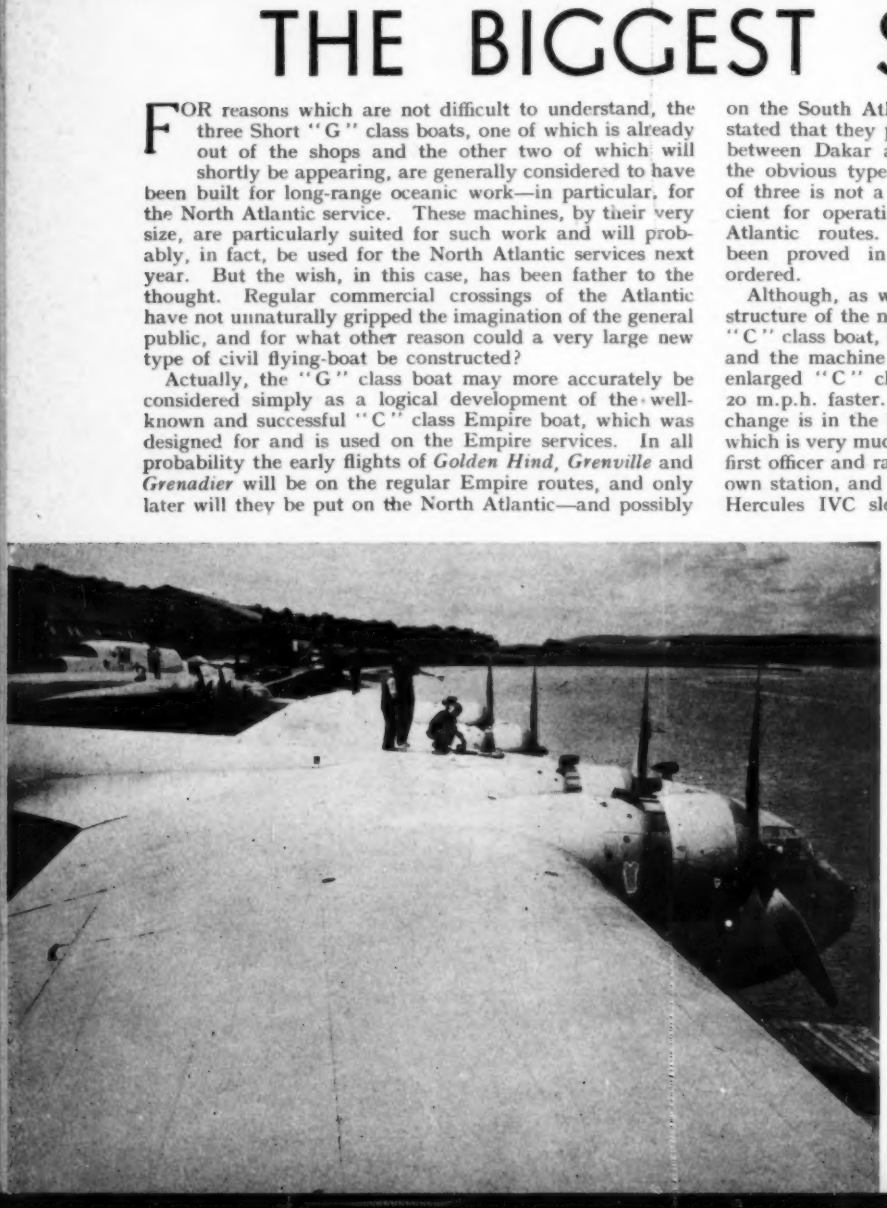
THE BIGGEST SHORT

FOR reasons which are not difficult to understand, the three Short "G" class boats, one of which is already out of the shops and the other two of which will shortly be appearing, are generally considered to have been built for long-range oceanic work—in particular, for the North Atlantic service. These machines, by their very size, are particularly suited for such work and will probably, in fact, be used for the North Atlantic services next year. But the wish, in this case, has been father to the thought. Regular commercial crossings of the Atlantic have not unnaturally gripped the imagination of the general public, and for what other reason could a very large new type of civil flying-boat be constructed?

Actually, the "G" class boat may more accurately be considered simply as a logical development of the well-known and successful "C" class Empire boat, which was designed for and is used on the Empire services. In all probability the early flights of *Golden Hind*, *Grenville* and *Grenadier* will be on the regular Empire routes, and only later will they be put on the North Atlantic—and possibly on the South Atlantic. British Airways have unofficially stated that they prefer to use flying boats for the crossing between Dakar and Natal, and the "G" class boat is the obvious type for this service when it starts. A fleet of three is not a very large one and would be only sufficient for operating a service over one or other of the Atlantic routes. Presumably, when these three have been proved in service, additional machines will be ordered.

Although, as will be gathered from the description, the structure of the new boat is very different from that of the "C" class boat, the general layout is more or less similar, and the machine can best be described as a considerably enlarged "C" class boat that should be something like 20 m.p.h. faster. Apart from the structure, the only real change is in the layout of the navigational compartment, which is very much larger and will carry not only a captain, first officer and radio operator, but also an engineer, at his own station, and a navigator. The four civil-rated Bristol Hercules IVC sleeve-valve engines give a maximum of 5,520 h.p. for take-off at 2,800 r.p.m. The normal maximum will be 1,025 h.p. for each engine—or 1,225 h.p. at 6,000ft. for level flight—and the cruising power will be 850 h.p. at 5,000ft. Three-bladed constant-speed airscrews are fitted.

Superficially the new craft might be described as an Empire boat with its dimensions multiplied by 1.15, but actually the differences between the older boats and the new are considerably greater than that. These differences are more pronounced in the hull than in the wing, the most obvious being the introduction of the type of rear step which has been found so successful in the Short Sunderland military boats.



Some of the 2,160 sq. ft. of wing area is shown in this view, which suggests that while the boat is at moorings the passengers—trained to walk in the right places—might get plenty of exercise by promenading.

The rear step of the "G" class boats is similar to that which has been found so successful on the Sunderland military boats. When this picture was taken the beaching trolley had not been dropped.

In connection with this rear step it is interesting to point out that recent overload tests with a smaller boat have indicated that this type of hull will enable very great loads to be taken off without excessive runs, and in the case of the "G" class boat this means that the gross weight could well have been a great deal higher than the 73,500 lb. for which the first three machines were stressed. At the time when the machine was designed, however, these overload tests had not been made, and the data available did not justify designing for a greater take-off weight. If more "G" class boats are ordered later, they could, presumably, be strengthened for a greater gross weight, just as the Empire boats were strengthened to a gross weight of 53,000 lb. instead of the original 40,500 lb.

But even at a gross weight of 73,500 lb. the "G" class boat is very efficient from a structural point of view, as will be realised when it is pointed out that when the first of the "G" class boats, the *Golden Hind*, was weighed recently it tipped the scales at 38,900 lb. This was, of course, the weight bare, and with a gross weight of 73,500 lb. gives a ratio of gross weight to tare weight of 1.8, a figure well above the average, which means that the machine carries as disposable load 85 per cent. of its own weight. If one takes a large number of aircraft of all types, large and small, a fair average figure is 60 per cent., so that in spite of the size of the *Golden Hind* the structural efficiency appears to be remarkably high. It would seem that the Short engineers have cheated the old "cube law" with a vengeance.

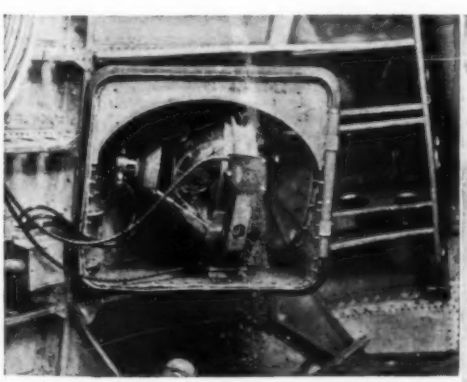
It is now many years since Mr. Arthur Gouge stated in a lecture that he did not see why the structure weight of large flying boats should necessarily be prohibitive, one of the reasons being that hull weight does not increase with size at the same rate as the wing weight, for instance. In the "G" class boat the wing loading is, of course, relatively high (approximately 34 lb./sq. ft.), but by no means excessively so, and this has obviously helped in keeping down the structure weight.

When one inspects the "G" class boats internally, and especially when one has seen them on the stocks, as *Flight's* representatives had an opportunity to do, it is discovered that the increase in size has made possible certain changes in structural design which must have had their effect on the good ratio of gross to tare weight. Briefly stated, these changes mostly take the form of using extruded sections in place of the bent-up sheet and strip sections employed in the keel and frames of the Empire boats.

Extruded Members

The keelson, which was a built-up channel-section member in the Empire boats is now an extrusion of what can only be described briefly as an "anchor" section. The stringers, too, are extrusions, the sections being a "T" with a bulbous edge to the vertical limb of the T. One side of the bulb is flattened to facilitate the attachment of sheet webs where such are wanted. In the planing bottom, that is to say, between keelson and chines, the hull frames are made up of plain T-section extrusions and flat sheet. Above the chines, and in the rest of the hull, the frames are of channel section, made up from sheet and strip.

An unusual feature of the hull design of the "G" class boat is that in the planing bottom the hull frames do not touch the skin, but finish inside the edges of the stringers, to which they are attached by simple angle brackets. This is boatbuilding practice applied to a large metal hull, and as such is worthy of note. One result is, of course, that when the skin panels curve inwards slightly under loads, as they must do where the loads are fairly high, such as on the planing bottom, no transverse ridges



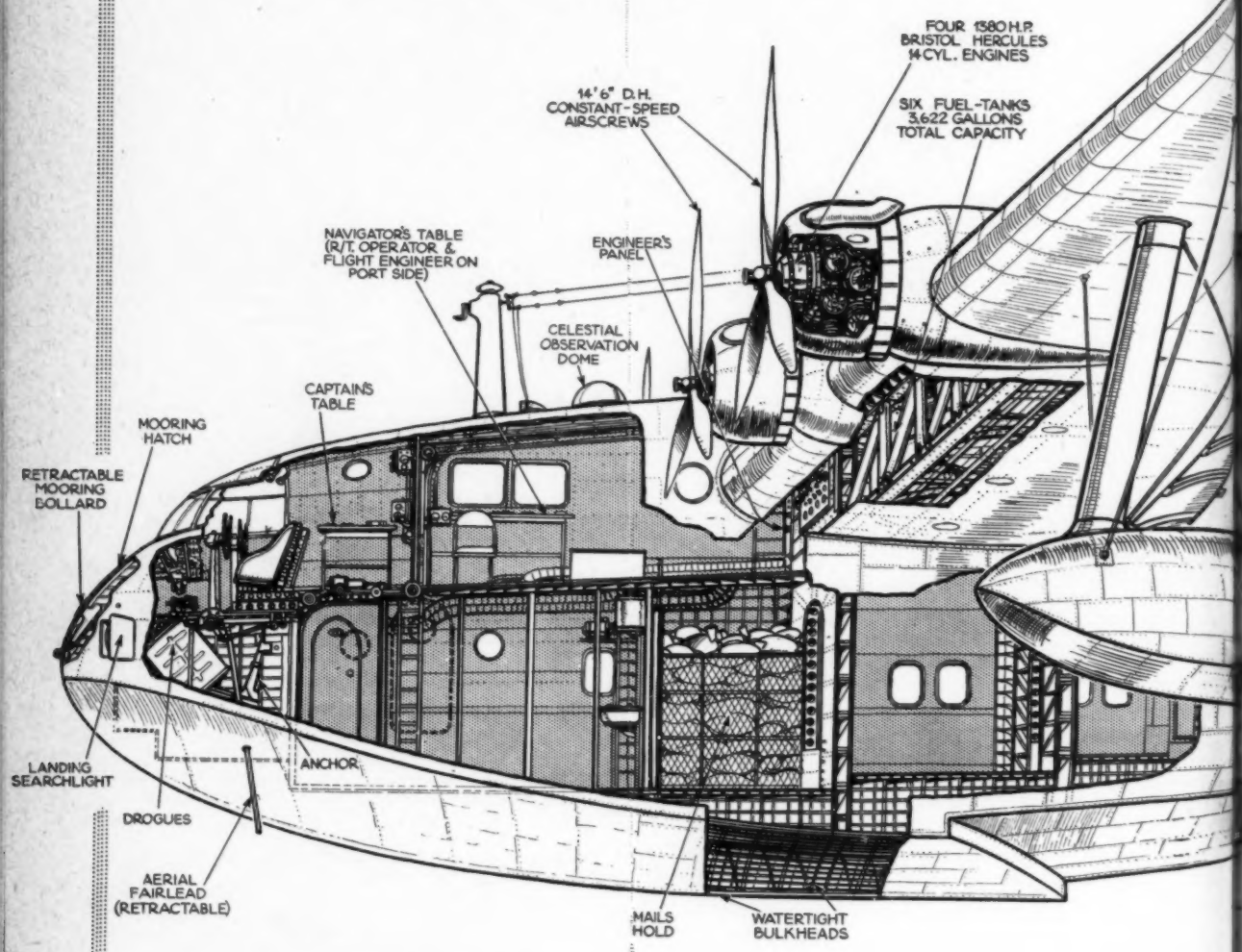
Interior and exterior views of the Rotax-Harley retractable searchlight in the nose. Teleflex controls give the beam elevating and traversing movement. The view on the right, incidentally, gives a good idea of the bottom plating.

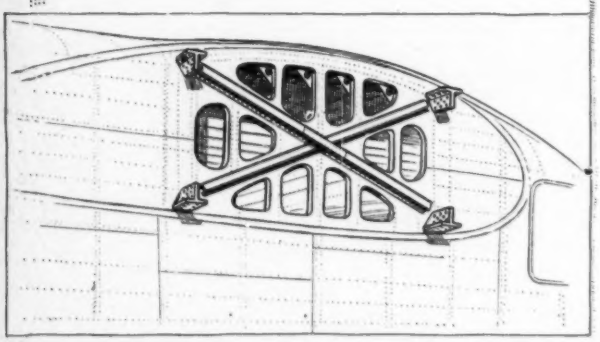
"Flight" photograph.

THE SHORT "G" CLASS FLYING BOAT

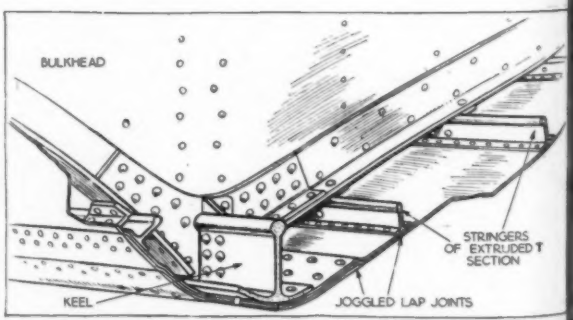
Details of the Internal Construction and Layout of a 32-ton Aircraft

(*Special "Flight" Drawing by F. Gordon-Crosby*)



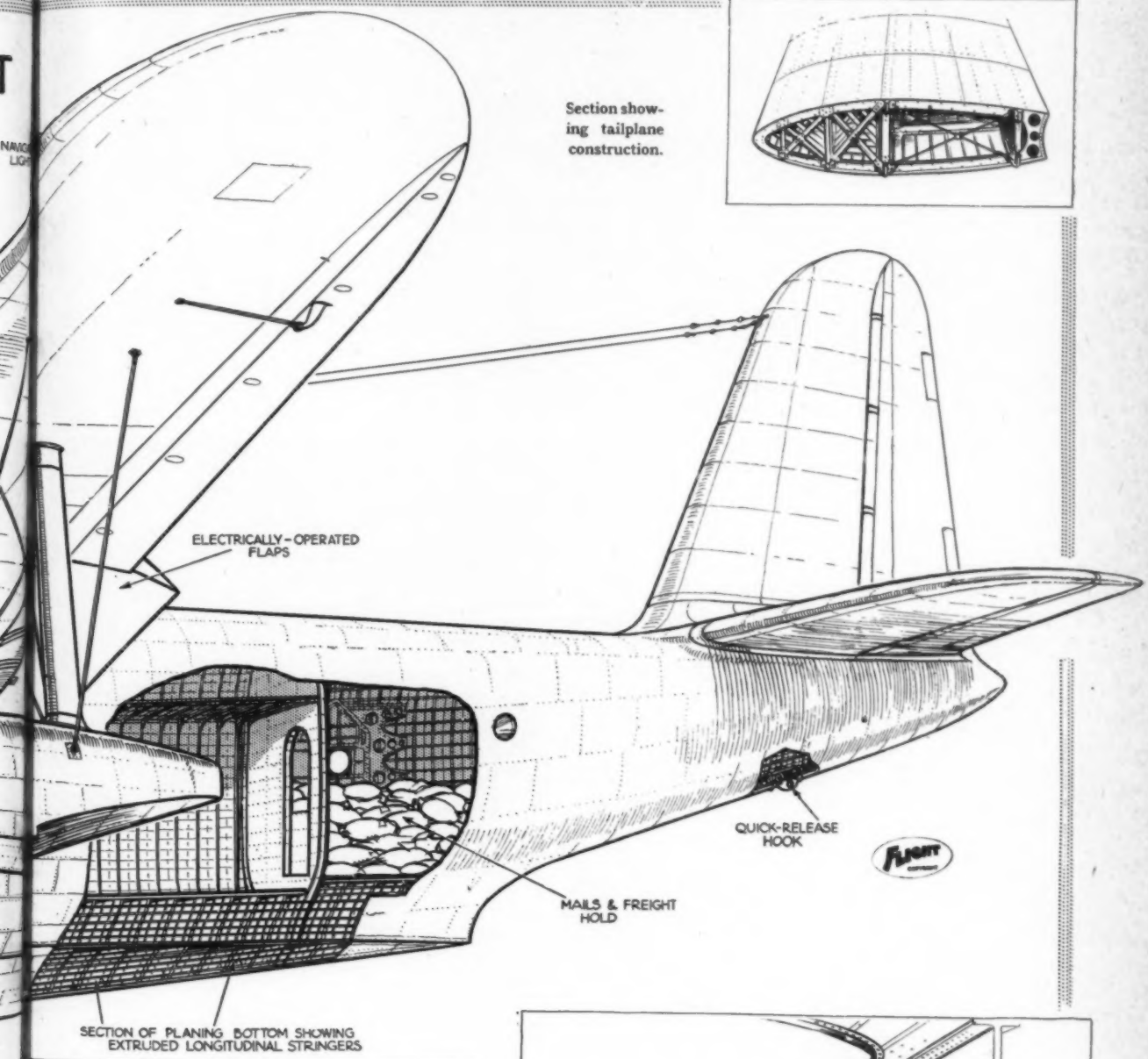


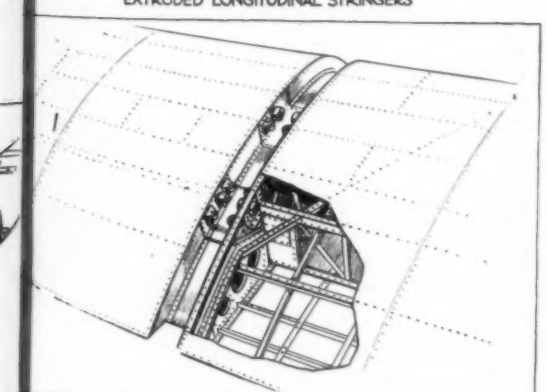
Detail of main wing spar joints.



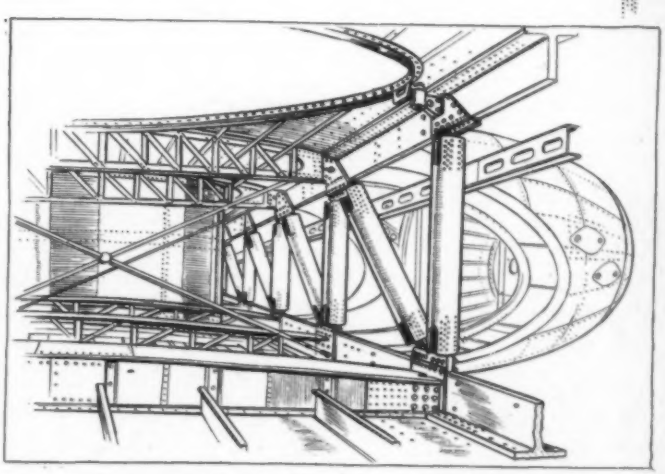
The planing bottom is of new construction with extruded T-section stringers.

Section showing tailplane construction.


ELECTRICALLY-OPERATED FLAPS
QUICK-RELEASE HOOK
MAILS & FREIGHT HOLD
SECTION OF PLANING BOTTOM SHOWING EXTRUDED LONGITUDINAL STRINGERS



The new electically operated flaps have rollers running in curved channels.

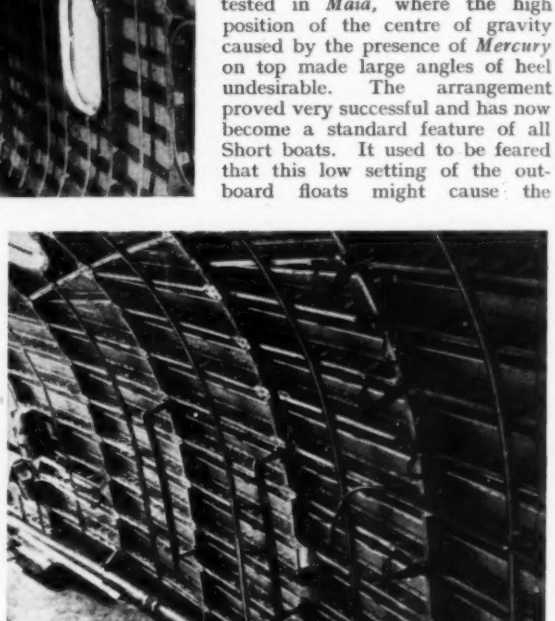


Wing construction, showing location of tanks and details of the spars.

View inside the hull of a "G" boat, showing not only the spaciousness but the general type of construction.

those of the Empire boats are used, and the four engines are placed in the same relative positions, with "cheese"-shaped petrol tanks installed in the wings. There is no fuel in the hull, even when the machine is used for maximum range.

Short Brothers were the first to introduce the low setting of the outboard floats, so that at only a small angle of roll one or other is in contact with the water. This was tested in *Maia*, where the high position of the centre of gravity caused by the presence of *Mercury* on top made large angles of heel undesirable. The arrangement proved very successful and has now become a standard feature of all Short boats. It used to be feared that this low setting of the outboard floats might cause the machine to swerve when on the water, but this has not been found to be the case. In the "G" class boats the floats are placed proportionately farther out towards the wing tips than they were in the Empire boats.



"Flight" photograph.

The Z-section stringers are stabilised, midway between main frames, by shallow channel-section strips, as shown in this photograph.

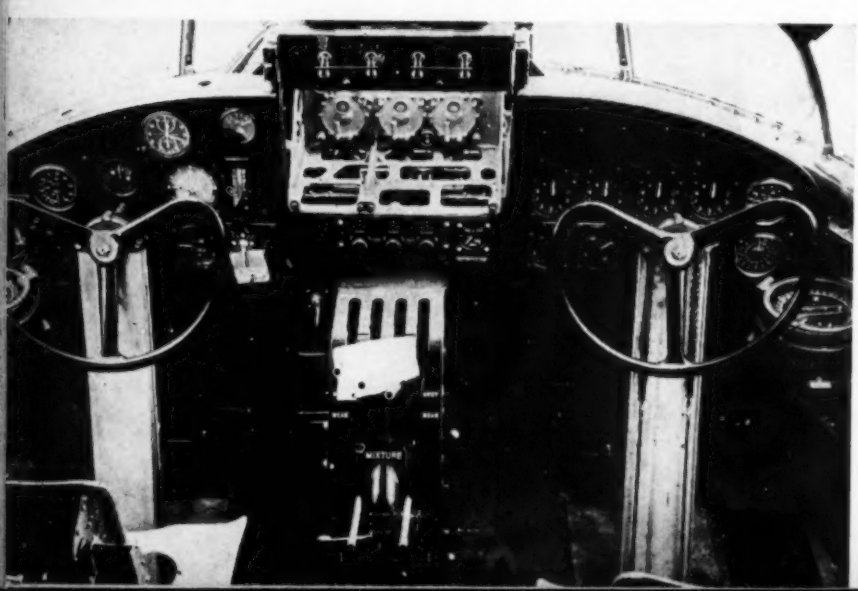
are formed, but only slight fore-and-aft ones, which probably have no effect on water resistance.

It should be explained here that the T-section extrusion with bulbous "foot" is used in the planing bottom only. Above the chines, and in the rest of the hull, the stringers are extrusions of Z-section, notched for the frames. The planking is in fairly large panels, the edges being joggled for smoothness and flush-riveting being employed everywhere.

It is obvious that when, as in the "G" class boat, the stringers only, and not the frames, are in contact with, and attached to, the skin, a certain amount of stabilising of the stringers is lost. In the *Golden Hind* this is made up for by riveting to the inside (i.e., free) edges of the stringers light strips of shallow channel section. These strips are little more than metal tapes, and are, in fact, used very much in the same way and for the same purpose as the linen tape used to be employed for stabilising the ribs in biplane wings. As far as possible this stabilising strip, which is used at about 6in. intervals, is in continuous lengths and is often taken around corners and bends.

Of the wing structure it seems only necessary to state that it is similar in general construction to that of the Empire class, so that it will suffice if we recall that the main spar is a box made of corner strips of extruded T-section (the limbs being nearly an inch thick), with tubular girder bracing in the two vertical planes and box ribs with sheet metal covering for the bottom and "lid" of the box. The trailing edge is of tubular construction, and the whole wing covered with sheet. Gouge-type flaps similar to

By way of indicating the enormous progress made in flying-boat design during the last ten years it is not without interest to recall that the Short *Sarafand*, designed to Air Ministry specification R.6/28, was of 70,000 lb. gross weight and had a wing area of 3,460 sq. ft. (i.e., a wing loading of 20 lb./sq. ft.). With its six Rolls-Royce engines it had a maximum speed of 150 m.p.h. and its range at a cruising speed of 105 m.p.h. was 1,450 miles in still air. The *Golden Hind* will cruise at approximately 180 m.p.h. and will have a still-air range of something like 3,400 miles when fitted up for mail-carrying over the Atlantic. If



As will be seen in this photograph taken in the partially finished *Golden Hind*, the control and instrument layout of the "G" class boat is very similar to that of the Empire type. One really noticeable difference is the fact that only the essential engine instruments are to be found on the right-hand side of the dashboard, the others being mounted in the engineer's own instrument panel at the rear of the navigation compartment.

"Flight" photograph.

all the disposable load were in the form of fuel it is thought that the maximum range would be not far short of 6,000 miles.

The only respect in which the *Sarafand* scored over the *Golden Hind* was in the take-off. With its much lower wing loading it required a good deal shorter run, although improvements in hull design have largely redressed the balance in the case of the new boats. And with its four Hercules engines giving 1,380 h.p. for take-off, not to mention controllable-pitch constant-speed airscrews, the thrust horse-power available is a much greater percentage of the normal total power than it was in the old six-engined biplane.

With a machine of this size it is possible to arrange the navigation compartment to provide really ample room for all members of the crew and to organise a correct dispensation of duties. The modern machine, whether civil or military, requires the attentions of a fairly large crew, each member of which must be something of a specialist.

The "G" class boat will be the first British machine, for instance, to have a separate section for the engineer, who will look after all the incidental engine instruments and controls, and will be in charge of the fuel system, the carburettor heater arrangements and the cooling shutter controls. Apart from the captain and first officer the other members of the crew will normally consist of a radio operator and a navigator.

The layout of the "flight deck" is basically similar to that of the "C" class boat, but this "deck" is obviously a great deal roomier and is modified in certain details. On the left, looking forward from the rear of the compartment, there is a partition which effectively covers the control and electrical leads, as well as the auxiliary engine and dynamo system used for emergency battery-recharging. This partition, through which the auxiliaries can be reached by means of a door, has two "desks," one for the flight engineer and one for the radio operator.

Behind the flight engineer's desk there is a panel carrying r.p.m. indicators, manifold pressure gauges, engine and oil temperature gauges, and mixture analysers, while on the desk itself are mixture control levers in their gates, as well as rotating knobs, four on each side, for the fine adjustment of the throttles and the airscrew pitch.

The engineer also looks after the main fuel cocks, and oil and engine cooler controls which are on the rear bulkhead of the control cabin. In the centre are eight vertically moving levers, six of which control the fuel cocks for the three wing tanks on each side, and two the draining tap and the feed balance for the collector boxes respectively. On either side of these central control levers are lateral moving levers, two on each side, to adjust the engine oil coolers, and control wheels for adjusting the main cooling shutters and for fuel feed balance testing.

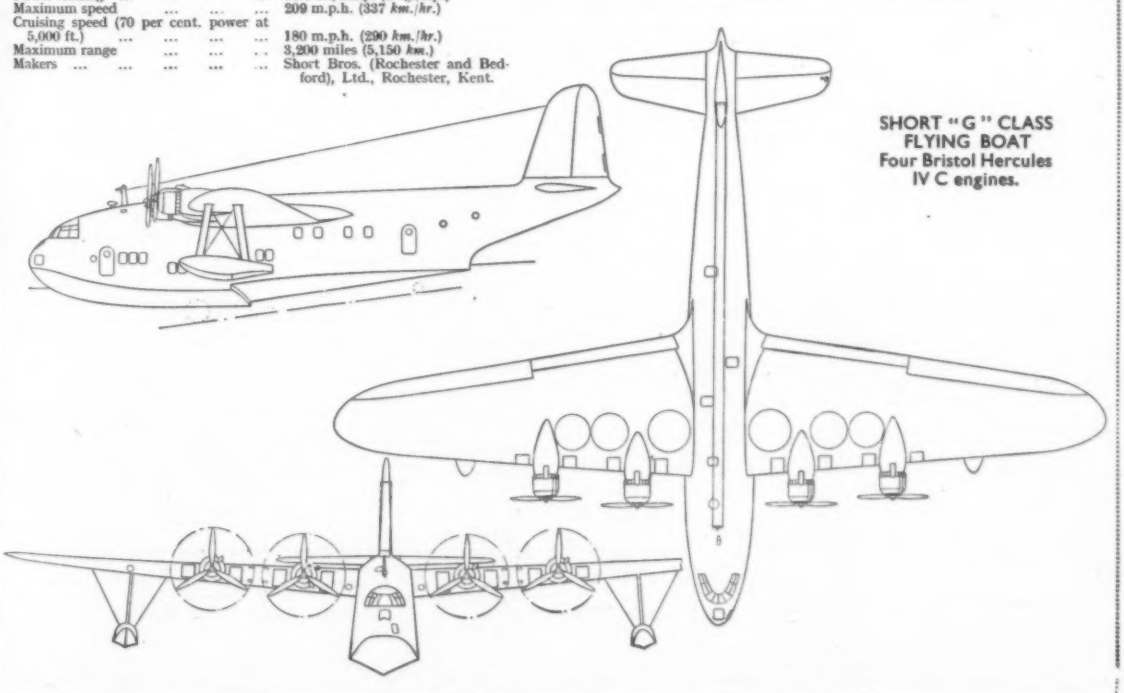
Fuel Supplies

Incidentally, the fuel system is somewhat complicated by the fact that any one of the six tanks must be able to feed all or any of the four engines. There are two fuel distributor centres. On the rear bulkhead are the four Televel gauges for measuring the fuel supply in each tank, both when the machine is in level cruising attitude and when it is on the water. In all, the six flat cylindrical tanks can carry a maximum of about 3,600 gallons, giving a range, with minimum load, of about 3,200 miles. The first boat, *Golden Hind*, will be a special long-range type in which the entire tankage will be used; the second machine, *Grenadier*, will be a medium-range type capable of 2,000 miles non-stop carrying twelve passengers and mail; and the third, *Grenville*, will be a comparatively short-range machine to carry twenty-four passengers and mail over a distance of 1,000 miles. Any one of them could fly something like 6,000 miles non-stop, or, alternatively, carry some 150 passengers on a short run.

The two sides of the recess carrying the radio operator's "desk" are designed to take the receiving and transmitting equipment, leaving only the essential dials and controls in view. The whole of this partition, with the alcoves, is quite one of the neatest installations of the kind which we have seen.

The navigator's position, again looking forward, is on the right of the machine opposite the radio operator's station. He will have ample light and space for his work, and almost immediately above him is the hatch through

Span	134ft. 4in. (41 *m.*)
Length	103ft. 2in. (31.4 *m.*)
Wing area	2,160 sq. ft. (201 *sq. m.*)
Weight empty (equipped)	37,700 lb. (17,100 *kg.*)
Crew	1,000 lb. (454 *kg.*)
Fuel and oil (long-range version)	28,060 lb. (12,727 *kg.*)
Payload	4,250 lb. (1,927 *kg.*)
All-up weight	73,500 lb. (33,340 *kg.*)
Wing loading	34 lb./sq. ft. (166 *kg./sq. m.*)
Power loading	13.3 lb./b.h.p. (6 *kg./h.p.*)
Maximum speed	209 m.p.h. (337 *km./hr.*)
Cruising speed (70 per cent. power at 5,000 ft.)	180 m.p.h. (290 *km./hr.*)
Maximum range	3,200 miles (5,150 *km.*)
Makers	Short Bros. (Rochester and Bedford), Ltd., Rochester, Kent.



SHORT "G" CLASS FLYING BOAT
Four Bristol Hercules IV C engines.

"Unlock controls before taking off" says the label on the uncomfortable-looking device poking into the pilot's back. Until they are unlocked the device remains in this aggressive position.

which a retractable dome emerges. When celestial sights are required, this dome is merely raised, and the navigator, while standing on the floor of his compartment, can take them in comfort.

When not at the controls, the captain takes a position immediately behind the first pilot's seat, where there is a little table for his use. In front of him is a window with optically corrected glass so that he himself may take sextant sights, either as a check on those obtained by the navigator or for practice. Except for those used by the pilots, all the seats are of the swivelling type.

The control and instrument layout in the pilots' compartment have been arranged so that crews experienced with the Empire boat shall notice no great change. The instrument placing is identical, and, as far as possible, the engine and trimming controls are similarly arranged.

Various items have, however, been tidied up; the engine control bank is somewhat more neatly arranged, though the throttle, mixture and airscrew controls are still in the same relative positions. On the pilot's left is the complete lighting control panel, and the various trimming cranks are arranged in the roof in such a way that they can be reached from either seat, with the Gouge flap control and its indicator on a panel to the left.

Electrical equipment in a craft of this size must be comprehensive, and Rotax are responsible for the greater part. In addition to such major items as magnetos—eight, of course—starters (four) and generators (two) there are a wing-flap operating motor, radio converter, Rotax-Eclipse airscrew ant-icing pump, Rotax-Harley landing lights, and Rotax-Weston cylinder pyrometers. In addition, this firm is responsible for the general lighting equipment.

FROM the CLUBS and SCHOOLS

EXETER.
HIGH winds and drizzle reduced flying time to 85 hr. during the week ended July 10. Mr. R. E. Hamlet has gone solo.

BEDFORD.
High winds greatly reduced flying time last week. Mr. J. Luck has joined as a new member.

SOUTH COAST.
Seventy-two hours were recorded last week. Messrs. R. C. McKechney and R. R. Paine went solo.

WESTON.
Bad weather conditions reduced flying time to 56 hr. during the week ended July 10. Mr C. Brundish has gone solo.

MARSHALLS'.
A total of 152 hr. 45 min. was recorded last week. Mr. B. M. W. Melvill-Jones and Mr. W. R. James carried out their first solo flights.

ISLE OF WIGHT.
A total of 49 hr. 35 min. was recorded during the week ended July 9. Messrs. C. Bound, B. Brennan and Mrs. P. Whillier have gone solo

IPSWICH.
Flying time for the week ended July 10 amounted to 76 hr. Signalling classes have started for the C.A.G. members, and Morse practice is continuing.

THANET.
During the week ended July 10, 96 hr. were recorded. Mr. F. L. Baker has gone solo. Twenty C.A.G. members are learning to fly while on holiday at the Ramsgate Flying Centre.

NORFOLK AND NORWICH.
Two members completed their first solo flights. During the week the G.A. Cygnet arrived for a demonstration. Last Thursday the club entertained thirty members of the Ipswich Aero Club.

CINQUE PORTS.
Over 102 hr. were recorded last week. Messrs. W. Garthwaite and V. Gibbons went solo. A dance will be held in the hangar at Lympne on July 26 for club and C.A.G. members and friends.

HANWORTH.
Club and C.A.G. members recorded 185 hr. during last week. Messrs. J. Roberts, D. Slade, F. Brown, G. Bargate, A. Bloomfield, E. Blackburn, P. Walker, D. Truscott and W. Ridgway have gone solo.

BROOKLANDS.
Flying time for last week amounted to 119 hr. 10 min. New members are Messrs. B. S. Harris, I. Parker and J. Dyson-Taylor. Miss Kay has made her first solo flight. Colonel Smith-Barry, of Gosport fame, and Count Zichy are taking Instructors' Courses. On Sunday there will be a tea patrol at Brooklands, and all other clubs are invited to "attack."

LONDON
In spite of unfavourable weather conditions during the week ended July 15, 143 hr. 35 min. were recorded.

PLYMOUTH.
Adverse weather conditions reduced flying time to 45 hr. during the week ended July 10. Mr. L. H. Worskett made his first solo flight. A new Tiger Moth has been delivered and is now in service.

PORTSMOUTH.
Club and C.A.G. members logged 136 hr. during last week. Sixty-two members of the C.A.G. are now flying solo and several others are ready to commence. Four aircraft attended the Rally at Sandown last week

YAPTON.
Over 61 hr. were recorded by club and C.A.G. members during the last week. Thirty-five members of the C.A.G. are now flying solo. Three aircraft, flying in formation, attended the Rally at Sandown last Friday.

WEST SUFFOLK
During the week ended July 16, 65 hr. were recorded. Miss E. Miller and Mr. L. E. G. Peveritt have joined the club as new members, while Messrs. A. O. Reeve, R. G. Playford, G. F. Boggis and R. S. Bower have joined the C.A.G.

REDHILL.
Flying time for the last fortnight totalled 217 hr. 15 min. Messrs. Jennings, Dimmock and Miller have gone solo. A flying display and garden party will be held at Redhill on Saturday, July 29, in aid of the Guild of Air Pilots' and Navigators' Benevolent Fund.

EASTBOURNE.
Flying time for the month of June amounted to 200 hr. Last week 50 hr. were recorded, and Mrs. M. Lovel and Messrs. C. G. H. Richardson, K. Savill, T. G. Griffiths, R. L. Fell went solo. A new aircraft has been purchased and work is in progress on the new hangar.

HORTON KIRBY.
Unfavourable weather conditions have reduced flying time to 189 hr. 45 min. this week. Mrs. L. M. Mason and Messrs. S. C. Hammond, E. E. Perry, A. J. G. Evans and C. N. Davies have gone solo. Cross-country flights were made to Le Touquet and Le Bourget. A new Tiger Moth has been delivered.

OVERSEAS.

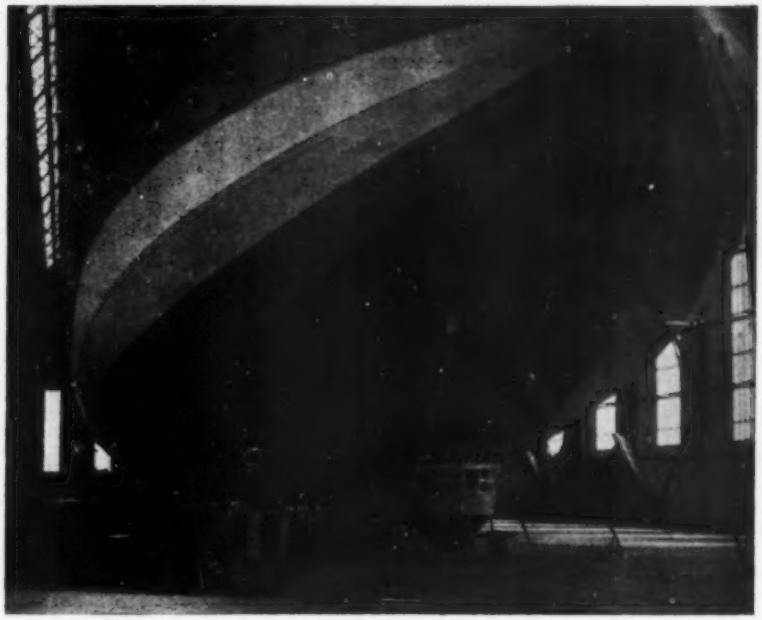
MADRAS.
Mr. Rana Yudhister Jung Bahadur has joined the club as a new member and Mr. McPherson has gone solo. Several cross-country flights have been carried out. Maj. Stephenson and Maj. Davy visited the club.

BOMBAY.
Flying time for June amounted to 113 hr. 25 min. Two Moths flew to Poona to commence the Poona flying season. Messrs. Ratnagar, Pinto and Zaveri did return cross-country flights to Sholapur.

THE END of AIRSHIPS?

Friedrichshafen to Build Aeroplanes : Work on L.Z.131 Ceases : Impressions During a Recent Visit to the Famous Factory

By MILES HENSLOW



The *Graf Zeppelin*, which has flown more than a million miles, is now a museum-piece at Friedrichshafen. A pay-box stands at the foot of the ladder.

EVER since the loss of the *Hindenburg* in May, 1937, the future of commercial airships has hung precariously in the balance; now it seems that, barring some entirely unexpected move, the question has been decided. Work on the latest German ship, L.Z.131, has been stopped, the factory at Friedrichshafen is being reorganised for aeroplane production, and the personnel of the operating company is being disbanded.

Though the "lighter-than-air school" is a comparatively small one in these days of high-speed aircraft, there are few who have followed the history of airships—certainly none who have travelled by them—who will not feel genuine regret at this news and all that it implies; even those who have done no more than marvel at a distant sight of the graceful silver ships must lament this rather ignoble end to a noble and ambitious dream.

It might seem, on the face of it, that it is an exaggeration to regard Germany's cancelled programme as the end of all airships; but it must be remembered that modern rigid airships are the direct result of German faith and endeavour, and that nine-tenths of the world's experience in that sphere is in German hands.

It is almost forty years since Graf von Zeppelin flew the first of his ships from Lake Constance. Since that day he and his followers have built more than a hundred airships, and overcome literally every obstacle and hazard that stood in their way.

First it was lack of money, and the once wealthy Count was reduced to selling his personal belongings in order to prove the practicability of his dream; then public feeling had to be won from laughter to enthusiasm. All this Zeppelin accomplished, though he was in his sixties when he began. He saw in airships a swift, reliable means of aerial communication between distant countries; he died before the end of the war that upset all his plans.

At the outbreak of war there were eight commercial Zeppelins in the air over Germany. Starting from scratch the company had evolved a useful type of ship, and trained officers, crews and ground staff. As a result of the Peace Treaty all that work stagnated for nine years.

With the building of L.Z.127, the famous *Graf Zeppelin* airships entered a new phase of their history; and under the tireless energy of Dr. Hugo Eckener the slate was rubbed clean of past prejudice; people in all parts of the world came to see in airships a new and fascinating form of travel.

Built as an experiment—*the* experiment that Count Zeppelin had in mind a quarter of a century before his time—the *Graf* carried thousands of passengers in her nine years of "experimental" flights. In all she sailed more than 1,000,000 miles, spent 16,000 hours in the air in all kinds of weather, visited thirty-eight different countries, and made one hundred and eighty-four successful Atlantic crossings.

But even before the *Graf* was launched, German experts were debating as to the advisibility of operating airships with hydrogen. Fire was the one remaining obstacle to be overcome, and that was already overcome in theory—by filling the ships of the proposed fleet with helium.

As it happened, the *Graf* met with no mishap in her really amazing career, but that by no means suggested that hydrogen was safe; on the contrary, when America agreed to supply helium for future ships, the plans of L.Z.129 and L.Z.130 were altered to allow for its use.

In the end helium was not available, and L.Z.129—the *Hindenburg*—was destroyed by fire. As a result of that accident, the *Graf* was retired, and with America's fresh promise to supply helium, L.Z.130 (nearly completed) was stripped and rebuilt. L.Z.131, her new sister ship, was laid down at Friedrichshafen.

The World Follows

Meanwhile, as a result of the good work done by the *Graf*, plans were afoot in other parts of the world to operate airship services; syndicates were formed in U.S.A., Britain, Holland and Japan. But the German company—the Deutsche Zeppelin-Reederei—with its years of useful experience, had already organised itself on sound and elaborate lines.

At Frankfurt, a mile or so from the airport, a little village had sprung up—Zeppelinheim—where officers and crews had their homes in its streets named after famous men. At the airport itself a second hangar had been built, at right angles to the first; in the course of time it was intended to build further hangars, a revolving one included, so that the ships could be housed and transferred in any wind. Ground crews, mooring masts, etc., were maintained in Spain and South America.

Such was the position when it was announced that the new ship, L.Z.130, would make her maiden Atlantic flight in April, 1938—and every berth was sold out six months in advance.

Then America suddenly refused helium supplies.

Though subsidised by the German Government, it was impossible for the Zeppelin-Reederei to keep going in-

definitely without revenue, its only income consisting of sixpences and shillings from sightseers to the retired *Graf*, so, after nearly two years of vain negotiations with America for helium, it was decided to disband the company.

With no hopeful future in view the officers and crew are dissipating into other industries, some into shipping, others into aeronautical jobs. Captain von Schiller, holder of "Airship licence No. 4," has already accepted the post of aerodrome manager at Cologne.

L.Z.130, hydrogen-filled, now makes occasional flights under the command of Captain Samnt, with Air Ministry officials on board, together with experts from various aeronautical industries. As has already been said, work on L.Z.131 has been stopped.

With crews disbanded, therefore, machinery laid up, and invaluable experience allowed to scatter with the winds, it would seem that the day of the airship is really done—and that before it has ever arrived. It can do no good to debate America's reasons for refusing helium; obviously, the reason given—"that the gas might be used for military purposes"—is an inadequate one, for with modern anti-aircraft guns no airship could last five minutes, even at 20,000ft., and the absolute ceiling of a modern ship such as the L.Z.130 is 10,000ft.

German's one hope—and, having fought for airships for nearly forty years, she will not give in without a fight—is that sufficient helium may be found inside the country to keep one or two ships in the air. Already they have a little helium, and so, for the time being, at any rate, L.Z.130 and a skeleton personnel are being retained.

Were helium supplies available there is no doubt that airships could more than hold their own as a swift, safe, and reliable means of trans-ocean transport for at least twenty years. Now, however, every year wasted makes the case for airships more forlorn, and, while one cannot help feeling the greatest sympathy and admiration for the German airship men, Dr. Eckener in particular, it looks as though their work has been in vain.

JERSEY KEEPS UP TO DATE WITH AIR TRANSPORT

"*Flight*" *photograph.*

The prototype D.H. Flamingo, which is now fitted out for passenger carrying, has been taken over by Jersey Airways as a preliminary to further orders. It is shown here flying over the coast of Jersey near St. Helier. Some impressions of the machine on the Jersey run appear on page 57.

Bottle Party?

THE Aéro-Club d'Arbois, in the Jura, is holding a two-day rally and competitions on July 29 and 30, and among the prizes are cases of the famous wines of the district—though they could conceivably prove embarrassing to English contestants faced with passing Customs on their return. The programme looks a thoroughly entertaining one. Full details are obtainable from the Aéro-Club d'Arbois.

The Willoughby Delta Accident

ON Monday of last week the little Willoughby Delta machine *St. Francis* crashed at Caulcott, near Bicester, both occupants being killed. The pilot was Mr. H. N. Olley, chief flying instructor at the Witney and Oxford Aero Club, and the passenger Mr. P. Nesbitt Willoughby, the designer of the machine. It appears that there were no eye-witnesses.

Mr. Willoughby had been managing director of the Willoughby Delta company for many years, and it was largely due to his perseverance and enthusiasm that the firm managed to carry on its expensive research programme in face of many difficulties. By many of his friends he was regarded as one of our most brilliant designers, and certainly he not only had original ideas, but he checked up on them by extensive wind tunnel tests in this country and in America so as to leave to guesswork nothing which could be ascertained before an actual machine was built. There is no reason to believe that the accident was due particularly to the unorthodox features of the machine. It had done a good deal of flying previously, and was demonstrated at the R.Ae.S. Garden Party last May.

Mr. H. N. Olley had been chief flying instructor at the Witney and Oxford Aero Club since March, 1938, and—to quote a friend's appreciation—he had earned the respect and affection of all who knew him; with sterling qualities of character he combined a charming personality, and his ability is shown by the fact that he held a pilot's "B" licence with Instructor's endorsement, a second-class navigator's licence, W/T certificate, and ground engineer's "A" and "C" licences.

The Swiss at Evere

THE Fokker Company states that the machines flown by Swiss pilots at the International Military Meeting at Evere, reported in *Flight* last week, were built by the Swiss Government and not at the Fokker works.

BREADTH and DEPTH in AIR STRENGTH

The Case for More Fighter Squadrons

By J. M. SPAIGHT, C.B., C.B.E.

IN a recent interview given to Group Captain L. G. S. Payne, the representative of the *Daily Telegraph and Morning Post*, Sir Kingsley Wood endeavoured to unravel a mystery which has caused perplexity to a good many people. That mystery is why, although aircraft have been pouring from the factories in growing volume in the last two years, we have only 125 squadrons in the Metropolitan Air Force now as compared with 123 in 1937. The programme of 1936, for 1,750 first-line machines, was completed last March. Our existing programme provides for the completion by March, 1941, of the 2,370 machines of the 1938 plan *plus* the 30 per cent. increase announced last November in the fighter component of that programme. At first sight the increase in the number of units in our home-defence establishment and in the number of first-line aircraft appears to be incommensurate with the output of the factories.

Three months ago we were spending £250,000 a day on aircraft alone, according to Sir Kingsley Wood's statement on March 9. That figure has increased to £2,000,000 a week, we know from his latest statement. We must be producing something between 750 and 1,000 machines a month at present. That rate of output does not imply, however, that the strength in Service squadrons or first-line aircraft is being, or could be, augmented proportionately. We produced in this country 26,685 aeroplanes in the ten months, January to October, 1918, and at the Armistice we had over 22,000 aeroplanes on charge; yet our first-line strength was then only 3,300 aircraft. The balance was made up of training machines, reserves, and a large number of unserviceable, obsolescent or even obsolete machines, not yet written off. Our strength at present must similarly be composed of machines which to a great extent do not affect first-line strength. It must include, for instance, a large number of training aircraft, which are never reckoned in first-line strength, and also, in view of the rapid development of design in these days and the ceaseless search for improvement in technical quality, a substantial proportion of machines earmarked for re-equipment.

The Proportion of Reserves

Machines held on squadron establishment—that is, first-line aircraft—are constantly being replaced as newer and improved types become available. Gladiators, which themselves succeeded Gauntlets, are being exchanged for Spitfires or Hurricanes in fighter units, Harrows for Wellingtons in bombing squadrons. The aircraft replaced counted already as first-line, and therefore the new machines, do not represent any addition to that strength, so far as numbers are concerned, though they do increase the fighting efficiency of the Air Force. It is merely a question of the substitution of one kind of machine for another.

Then there is the question of reserves, to which Sir Kingsley Wood drew special attention. Reserves, he said, were a matter of vital importance. The casualties in war may range from 80 to 100 per cent. per mensem of the squadron effectives. Replacement of losses may necessitate an almost complete re-equipment of the Air Force six times over in the first six months of war. For that reason it was suggested by Mr. H. A. Jones, the official historian, in Vol. VI of *The War in the Air*, that we should accumulate in peace a reserve of 500 per cent. to bridge the gap, which he reckoned as six months as a minimum, between zero hour and the time when our war production of aircraft would begin to get into its stride. The need for such a colossal reserve has been obviated to some extent by the establishment of the shadow factories, which constitute an anticipation in peace of the system which it had originally been intended to introduce only when war began. Nevertheless, large reserves are essential if our squadrons are to have ample replacements in the early months of a conflict. Pilots, as well as machines, must be available to take the place of casualties.

What the proportion of reserves to first-line is in our own and foreign Air Forces is a carefully kept secret. In a recent book M. Pierre Cot, the former French Air Minister, estimated the ratio in general at 60 per cent. Some powers may have an even higher ratio. General Ladislas Sikorski, the former Polish War Minister, suggested in a recent article that the Soviet air force had a reserve representing 100 per cent. of its first-line strength. At least 50 per cent. may safely be assumed to be the minimum maintained by any country. It would be a dangerous gamble to allow the reserve to fall below that percentage.

The building up of reserves is an unspectacular affair. It would look better if the addition to armed strength could be displayed in a visible increase in the number of squadrons maintained on the establishment. The formation of new units, however, is a far more costly and intricate business than the mere augmenting of the reserves, either of *matériel* or *personnel*. An organisation has to be created; *personnel* have to be found for the unit; buildings have to be provided, and these, with the land, may cost anything up to half a million sterling for a two-squadron station. At the best, the incorporation of a new unit in the existing Air Force takes time to accomplish.

What We May Expect

Nevertheless, the addition of squadrons may be a vital necessity in view of the growing threat to our safety in these islands. There are signs and tokens that, if Germany strikes, she will strike in the first place at our great centres of population, London above all. A spokesman of the Axis has boasted that the German and Italian air forces could destroy London and Paris in a few hours. A devastating blow in the air is expected to assure for the dictators the victory for which they could not hope in a protracted war. A knock-out blow is to be aimed at the enemy's heart. It will be a formidable one. The Air Raid Defence League has calculated that Germany could hurl 1,200 to 1,500 bombers against this country on the outbreak of war. That number would possibly now be augmented by Italian aircraft in view of the military arrangements made between the two dictatorships. We must clearly be prepared for a mass attack in the air at the beginning of a conflict.

Clearly it would make a vast difference if, to meet that attack, we had 1,000 or more interceptors instead of 500 to throw up into the 15,000ft. layer and above it. In such a situation breadth rather than depth of defensive air strength would be what mattered. Reserves might be of little worth if the first blow was so shattering that they might, perhaps, never be brought into use. That fact must be perfectly well known to the Air Staff and the Committee of Imperial Defence; and Lord Chatfield, we know from several of his utterances, is fully alive to the need for meeting and defeating the enemy in the air as on the sea. The question, it is consoling to reflect, may safely be left in their competent hands.

In normal peace conditions finance might be an abstacle, but one may assume that in the present circumstances no Treasury objection would arise if new squadrons and stations were considered to be necessary. Sir Kingsley Wood stated in the interview already referred to that new squadrons would have to be formed to give effect to the increases announced in the later part of last year. He was careful, also, not to rule out the possibility of still further additions. It may be, indeed, that the still increasing power of Germany in the air may necessitate for us an even vaster programme of construction and training than we have as yet envisaged. Already we have had to enlarge our ideas upon this subject more than once, and it is probable that the process is not yet completed.

THE ROYAL AERO CLUB

News and Official Notices for *the Week Ended July 15*

Advances for C.A.G. Clubs

IMPROVED facilities for obtaining suitable aircraft equipment for C.A.G. training purposes will result from the approval by the Executive Committee of the General Council of Associated Light Aeroplane Clubs of the draft agreement with the Air Ministry governing payment of advances.

The agreement provides for cash advances towards the purchase of the aircraft required to the extent of £150 for a light aeroplane of under 1,200 lb. weight and £250 for a standard aeroplane of over 1,200 lb. It also provides for the advance of 50 per cent. of the price paid for used aeroplanes, up to a limit of £150. These advances are repayable to the Air Ministry by deduction from the subsidy grant at the rate of £25 per month per aircraft. The date fixed for the operation of this scheme is June 1, 1939. This date applies to the delivery of new aircraft irrespective of whether previous deposits had been paid. All aeroplanes coming under this agreement must be insured against total loss for a sum not less than the sum to be advanced by the Air Ministry.

Flying Limitations

PREPARATIONS are being made for air exercises, at the beginning of August, on a bigger scale than ever before. During this period, private aeroplanes and club machines must avoid flying over the east coast of England from Spurn Head all the way down to Folkestone. The prohibited areas will extend out to the limits of territorial waters. Royal Air Force aircraft will be operating in these areas and may fly within clouds; consequently all civil machines are warned to keep clear.

Full details are given in *Notice to Airmen No.* 208 *of* 1939.

Royal Aero Club Terms of Membership

TOWN Members—£8 per annum; Country Members (those residing outside a radius of 50 miles from Charing Cross and having no business or private address within that radius)—£5 5s.; Officers serving on the active lists of the Royal Navy and Royal Marines, the Regular Army and the Royal Air Force—£5 5s. Members joining after June 30 pay half the subscription for the current year.

Balloon Racing

ON September 3 the start of the Gordon Bennett Balloon Race will take place at Lwow, in Poland. Details of the regulations and entry forms are available from the Secretary of the Royal Aero Club. The closing date is August 10.

On the Air Routes

DENMARK:—Gunnery practice will take place in *Koge Bay* (15 miles S.W. of *Copenhagen*) from July 31 to August 4 inclusive. Pilots are warned not to fly above the Bay at a height less than 4,000 metres (13,124ft.) during the above mentioned dates.

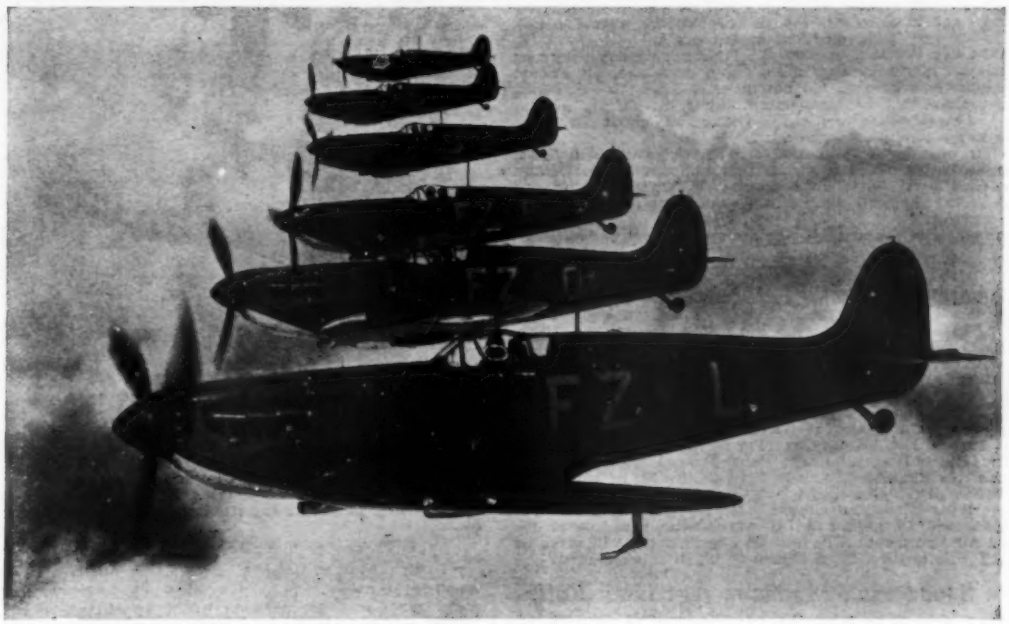
FRANCE:—*Perpignan-La Salanque*: Air gunnery practice will be in progress until October 30. A rectangular strip 9 km. long, oriented N. to S. on the E. bank of *Leucate Lake* (North of *Perpignan-La Salanque Aerodrome*) is used as a range for these exercises. Great caution should be exercised in the vicinity of this area.

Coetquidan Camp:—An observation balloon will be sent up in the vicinity of *Coetquidan Camp* (26 miles S.S.W. of Rennes) until September 28. Maximum height of ascent, 1,200 metres.

Aviators' Certificates

No.	Name	Club or School	Date
18,920	Lionel Colston Messiter	Midland Aero Club	29.6.39
18,921	Rosemary Dorothy Mould	County Flying Club	29.6.39
18,922	Cyril Harris	Wiltshire Flying Club	29.6.39
18,923	Alexander John Youngson Brown	Wiltshire Flying Club	29.6.39
18,924	William Morrison	Scottish Flying Club	29.6.39
18,925	Catriona Menzies Anderson	Scottish Flying Club	29.6.39
18,926	Edmund Nutt	Isle of Wight Flying Club	29.6.39
18,927	Louis Victor Floyd	Isle of Wight Flying Club	29.6.39
18,928	Rodney George Grey Kent	London Aeroplane Club	29.6.39
18,929	John Jabez Over	Romford Flying Club	29.6.39
18,930	Rowland Thomas Beith	Ipswich Aero Club	29.6.39
18,931	George Henry Corbett	De Havilland School of Flying.	29.6.39
18,932	John McInerney	Liverpool and Dist Ae. C.	30.6.39
18,933	George David Terry	Liverpool and Dist. Ae. C.	30.6.39
18,934	William Noel Rayner	London Air Park F.C.	30.6.39
18,935	Lionel Stedman Wilkder	London Air Park F.C.	30.6.39
18,936	Nancy May Young	London Air Park F.C.	30.6.39
18,937	William Ferguson Ewing Watson	County Flying Club	30.6.39
18,938	Leslie Donald Stuart	Romford Flying Club	30.6.39
18,939	Ronald Andrew Mercer	Herts and Essex Ae. C.	30.6.39
18,940	William John Mair	Isle of Wight Flying Club	30.6.39
18,941	Basil Arthur Quarton Wynyard-Wright.	Exeter Aero Club	30.6.39
18,942	Eric Stanley William Haydon	Exeter Aero Club	30.6.39
18,943	Oliver Rayner Matheson	De Havilland School of Flying.	30.6.39
18,944	Sydney John Anthony Evershed	No. 30 E. and R.F.T.S. (Derby).	1.7.39
18,945	John Peter Massey	Air Service Training	1.7.39
18,946	Robert Tudor Jones	Wiltshire Flying Club	1.7.39
18,947	Donald Campbell	Tollerton Aero Club	1.7.39
18,948	Alfred Maurice Illingworth	Tollerton Aero Club	1.7.39
18,949	Ian Macdonald Munro	Tollerton Aero Club	1.7.39
18,950	Percy Campbell Hoyle	Portsmouth Aero Club	1.7.39
18,951	William Turner	Portsmouth Aero Club	1.7.39
18,952	Peter Harold Bannister	Doncaster Aero Club	1.7.39
18,953	Frederick Richard Edmonson	Yorkshire Aeroplane Club	1.7.39
18,954	Peter Yorke	Yorkshire Aeroplane Club	1.7.39
18,955	Frederick Bruce Ryan Wilson	Lancashire Aero Club	1.7.39
18,956	George Allan Essex	Liverpool and Dist Ae. C.	1.7.39
18,957	Cyril Durrant Metcalf	Norfolk and Norwich Ae.C.	3.7.39
18,958	Sidney George Fidoe	Herts and Essex Ae. C.	3.7.39
18,959	Agnes Fielding Murray Bayles	Tollerton Aero Club	3.7.39
18,960	David Hope Morrison	York and Leeming F.C.	3.7.39
18,961	Michael John Lindsay	Brooklands Flying Club	3.7.39
18,962	Eaton Holroyd Robinson	Bristol and Wessex Ae. C.	4.7.39
18,963	Andrew Alexander John Thorburn	Strathtay Aero Club	4.7.39
18,964	Stanley Cyril Retter	Exeter Aero Club	4.7.39
18,965	Gwendolen Corisande Stratford Prince.	Exeter Aero Club	4.7.39
18,966	Geoffrey Lionel Walmsley	Airwork Flying Club	4.7.39
18,967	Edward Richard Sawyer	Airwork Flying Club	4.7.39
18,968	Charles Augustus Coleman	London Air Park F.C.	4.7.39
18,969	Charles Francis Callender	Witney and Oxford Ae. C.	4.7.39
18,970	John Peacock	Coventry Aeroplane Club	4.7.39
18,971	Ove Back	Witney and Oxford Ae. C.	4.7.39
18,972	Hugh McDonald Robertson	York and Leeming F.C.	5.7.39
18,973	Wallace Stafford Wintle	Thanet Aero Club	5.7.39
18,974	David John Fell	Malling Aero Club	5.7.39
18,975	Williard George James	London Aeroplane Club	5.7.39
18,976	Percival Henry Brown Sprosen	London Aeroplane Club	5.7.39
18,977	Geoffrey Edmund Wm. Hitchcock	London Aeroplane Club	5.7.39
18,978	Douglas Walter Ellis	Bristol and Wessex Ae. C.	5.7.39
18,979	George Clifford Chick	Bristol and Wessex Ae. C.	5.7.39
18,980	Nancy Goodfellow	Liverpool and Dist. Ae. C.	6.7.39
18,981	Robert Fairbrother Harrison	Liverpool and Dist. Ae. C.	6.7.39
18,982	Gordon Andrew McKenzie	Liverpool and Dist. Ae. C.	6.7.39
18,983	John Hogg Dugdale	Liverpool and Dist. Ae. C.	6.7.39
18,984	George Buckley	Liverpool and Dist. Ae. C.	6.7.39
18,985	Grahame Geoffrey Boswell	Norfolk and Norwich Ae.C.	6.7.39
18,986	Darrell John Robert Moore	Brooklands Flying Club	6.7.39
18,987	Thomas William Gracey	Brooklands Flying Club	6.7.39
18,988	Ronald Henry Barber	Lancashire Aero Club	6.7.39
18,989	Andrew George Pasley	Northants Aero Club	6.7.39
18,990	Charles William Woodman Cooper	London Aeroplane Club	7.7.39
18,991	Rhondda Rankin	Doncaster Aero Club	7.7.39
18,992	Christopher Charles Tomkinson	Worcestershire F.C.	7.7.39
18,993	Harry Robert Poulsom	Worcestershire F.C.	7.7.39
18,994	Pamela Rosemary Una Bullock	Isle of Wight Flying Club	7.7.39
18,995	Robert Winterburn	Blackpool and Fylde Ae.C.	7.7.39
18,996	Charles Eric Harker	Blackpool and Fylde Ae.C.	7.7.39
18,997	James Affleck	Blackpool and Fylde Ae.C.	7.7.39
18,998	Thomas Cheetham Taylor	Blackpool and Fylde Ae.C.	7.7.39
18,999	Andrew Lawson Ramsay	Strathtay Aero Club	7.7.39
19,000	Percival Clifford Wall	Weston Aero Club	7.7.39
19,001	Harold Frederick Harris	Weston Aero Club	7.7.39
19,002	Edward John Chidgey	Weston Aero Club	7.7.39
19,003	Jack Matthews	Weston Aero Club	7.7.39
19,004	Laurence John Halley	Weston Aero Club	7.7.39
19,005	Sidney Alan Rees	Weston Aero Club	7.7.39
19,006	Ian Stewart Fossett	Weston Aero Club	7.7.39
19,007	William David Payne	Weston Aero Club	7.7.39
19,008	William Owen Thompson	Weston Aero Club	7.7.39
19,009	Ernest Garth Fidler Lyder	Weston Aero Club	7.7.39
19,010	John Frederick Palmer	No. 7 E. and R.F.T.S., Desford.	7.7.39
19,011	Harry Footer Rampley	Ipswich Aero Club	8.7.39
19,012	Herbert Wiggins	Ipswich Aero Club	8.7.39
19,013	David Standing Thomas	York and Leeming F.C.	8.7.39
19,014	Thomas Leonard George Ashford	Wiltshire Flying Club	8.7.39
19,015	Henry Rudolf Trost	South Coast Flying Club	8.7.39
19,016	Colin John Vincent Gray	Doncaster Aero Club	8.7.39
19,017	James Alwyne Lawrence	York and Leeming F.C.	8.7.39
19,018	William Arthur Willcox	Redhill Flying Club	8.7.39
19,019	John Stephen Walters	West Suffolk Aero Club	8.7.39
19,020	Charles Girdham	Yorkshire Aeroplane Club	10.7.39
19,021	Lewis Alfred Booth	Yorkshire Aeroplane Club	10.7.39
19,022	John Trevor Cooper	Cinque Ports Flying Club	10.7.39
19,023	John Oswald Johnston	North of Ireland Ae. C.	10.7.39
19,024	John Collins McCall	York and Leeming F.C.	10.7.39
19,025	Wallace Richard James	Airwork Flying Club	10.7.39

SERVICE AVIATION



"MONOPLACES DE CHASSE CRACHE FEU": Spitfire eight-gun fighters of the squadron which in company with formations of Hurricanes, Blenheims, Hampdens and Wellingtons represented Great Britain in the great parade of aerial and terrestrial might staged in Paris last week.

Royal Air Force and Official Announcements:

Fleet Air Arm News: Military Aviation Abroad

Higher Appointment

THE Air Ministry announces the appointment of Group Capt. John Walter Cordingley, C.B.E., to assume the duties of Director of Manning, Air Ministry, with effect from July 17.

Group Captain Cordingley, who was born in 1890, joined the Royal Naval Volunteer Reserve in 1905 and in 1918 was appointed to the rank of Major in the Royal Air Force, assuming the duties of Staff Officer, Class 2, in the Directorate of Manning at the Air Ministry.

He was awarded the O.B.E. in 1919, and in the same year was granted a permanent commission in the Royal Air Force with the rank of Squadron Leader. Since 1922 he has been in command of the Record Office, Ruislip, and in the Birthday Honours List of 1937 was promoted to C.B.E.

He was promoted to the rank of Wing Commander in 1924, and to his present rank in 1931.

As Director of Manning he will be responsible to the Air Member for Personnel for planning the man-power requirements of the R.A.F. and for the executive control of recruitment for the R.A.F. and for the Volunteer and Regular Reserves.

R.A.F. Flight Over France

FOLLOWING on the display by Wellingtons and a Hurricane at Evere, on Tuesday, July 11, twelve squadrons of Wellingtons, Hampdens, Blenheims and Battles, numbering in all over 100 aircraft, started off at 08.00 hours from their home stations in the Midlands for a flight over France, which had been arranged by agreement with the French Government.

The long-range craft followed the route Havre, Le Mans, Samur, Bordeaux, Angers, Caen, and so back to England, a non-stop flight of about 1,200 miles. The others followed the route Le Treport, Orleans, Le Mans, and crossed the coast near Cherbourg on their way home, a total of nearly 900 miles. All flew at a height of 2,000 metres (6,500ft.), except when over the larger towns, when they came down to 1,000 metres (3,250ft.) in order to show themselves off to the inhabitants. All the machines returned safely to their home stations. Similar flights are to be made this week.

The arrangement is that French squadrons shall pay a return visit by making a flight over Great Britain—probably it will take place this week.

The Paris Demonstration

ONE squadron each of Spitfires, Hurricanes, Blenheims, Hampdens and Wellingtons joined with Morane 406s, Curtiss P.35s, Potez 63s, Breguet 691s, Bloch 131s and Liore 45s of the French Air Force in a fly-past over Paris preceding the parade in the Champs Elysées last Friday. The fly-past was led by a single-Morane 406, piloted by General d'Harcourt, Inspector-General of the French fighter force. In the first place it was intended that the British fighters should lead, but it was thought that they might experience some difficulty in keeping formation at 175 m.p.h., which was the agreed speed. Instead, the British bombers were in the vanguard, the Spitfires and Hurricanes bringing up the rear and demonstrating their speed by passing the main body as it flew along the Champs Elysées. The squadrons flew at different heights, the lowest being the graceful Potez 63 twin-engined fighter-bombers. In all, 315 aircraft took part, 45 being British. Air Chief Marshal Sir Cyril Newall, Chief of the Air Staff, left for Hendon later in the day in a Percival Q 6.

Distinguished Flying Medal

HIS MAJESTY THE KING has been graciously pleased to approve the undermentioned reward for gallant and distinguished service in Palestine:—

Distinguished Flying Medal.—Sgt. Harry John Goodchild.

On May 23, 1939, Sgt. Goodchild located armed rebels near Kh. Wazil and took vigorous air action against them in extremely difficult flying country. The fighter machine which he was flying was subjected to heavy fire from dense coverage, and, after several hits, the air-pressure system was put out of action. Sgt. Goodchild, after flying back to Ramleh, returned to the area in another machine and continued his previous tactics of holding the rebels until the arrival of the British ground forces. He displayed great gallantry, daring and flying skill.

Sgt. Goodchild has taken a conspicuous part in a number of major engagements and his name has twice been brought to the notice of the General Officer Commanding, British Forces in Palestine and Trans-Jordan for distinguished conduct.

The Consolidated Arrives

WHAT is undoubtedly a very fine flying boat arrived at the Marine Aircraft Experimental Establishment, Felixstowe, last Friday. Just how fine a craft it is will be ascertained during the next few weeks.

The machine was a Consolidated 28-5 long-range military boat which had flown non-stop from Botwood, Newfoundland, to Felixstowe.

She left the manufacturers' plant at San Diego, California, at 4.23 p.m. G.M.T. last Monday week to fly non-stop the 3,000 miles to Botwood, Newfoundland, but made an intermediate landing at Buffalo as, having had a 30 m.p.h. wind all the way, fuel was

SERVICE AVIATION (CONTINUED)

beginning to run rather low, but Capt. Rogers says that he could have got to Botwood, though without any reserve petrol. Buffalo is the site of the old Consolidated works.

The boat left Botwood at 2.29 B.S.T. last Thursday afternoon and reached Felixstowe, 2,450 miles away, at 6 a.m. on Friday. Capt. Rogers, in command, did not make straight for Felixstowe, as he understood that machines were flying in the vicinity without lights. The average speed across the Atlantic was about 180 m.p.h. as there was a strong following wind.

The crew was the same as that for the sister machine *Guba*, which recently completed a survey flight of the Indian Ocean: Mr. Russell Rogers, pilot; Capt. Lewis A. Yancey, co-pilot and navigator; Mr. Raymond Boothe, radio operator; and Mr. Gerald Brown, engineer.

A photograph of the machine appears on this page.

Sir Kingsley Wood for Belfast

ACCOMPANIED by senior officers of the Royal Air Force, the Secretary of State for Air will visit the Reserve Units of the R.A.F. in Northern Ireland on Friday and Saturday, July 28 and 29. Sir Kingsley will be the guest of the Prime Minister of Northern Ireland and Viscountess Craigavon, and will discuss with Lord Craigavon the question of recruiting for the Reserve and Auxiliary Units of the R.A.F. in Northern Ireland. On arrival at Belfast Harbour Airport on Friday evening, July 28, Sir Kingsley will drive to the Town Centre of the R.A.F. Volunteer Reserve in Donegall Place. The following morning he will make a tour of the Short and Harland works, where Herefords and Bombays are in production. In the afternoon, with Lord Craigavon, he will attend an air display at the airport in which the local Air Force units and the latest types of Service aircraft will take part. A number of flying boats will fly past, and No. 502 (Ulster) Squadron of the Auxiliary Air Force, returning from its annual camp, will make its ceremonial visit to the City of Belfast to which it is affiliated.

Balloon Squadrons : Minimum Age Limit Raised

WITH a view to assisting the recruitment of young men for the field force units of the Territorial Army and the flying units of the Auxiliary Air Force and Royal Air Force Volunteer Reserve, it has been decided that the lower age limit for entry into the balloon squadrons of the Auxiliary Air Force should, with certain exceptions, be raised from 25 years to 30.

Men under the age of 30 years, however, for whom no vacancies exist in the local flying units of the Auxiliary Air Force or the Royal Air Force Volunteer Reserve or the field units of the Territorial Army, or who are not medically fit for service with field force units, will continue to be eligible for appointment to balloon squadrons.

The New Staff College

"IN this setting will be created a seat of learning, the main objects of which are the preservation of peace and, in case of necessity, as I hope all will realise, the defence of our homes and the principles and ideals which have made England what she is, and the fulfilment of our international obligations," said Air Chief Marshal Sir Cyril Newall when he cut the first turf on the site of the new Royal Air Force Staff College at Ramridge House, Weyhill, on July 15.

Sir Cyril emphasised the value to the youngest of the fighting services of the traditions and ancient historic background of Ramridge House, which dated back to Edward the Confessor. A short appreciation of the Manor of Ramridge, he remarked, appeared in the Domesday Book, and it also had associations with Chaucer. He had no doubt that these connections with ancient traditions, history and art, would be of great value to the Air Force, which was still engaged in building its own traditions and making its own history.

"We may mechanise 100 per cent., but the human element will always remain the predominant factor," he added.

He said that many modifications and additions to the old house would be necessary to make it suitable as a Staff College, but every endeavour would be made to avoid impairing its architectural features. Sir James West, designer of the R.A.F. Cadet College, Cranwell, would be responsible for the various modifications and extensions.

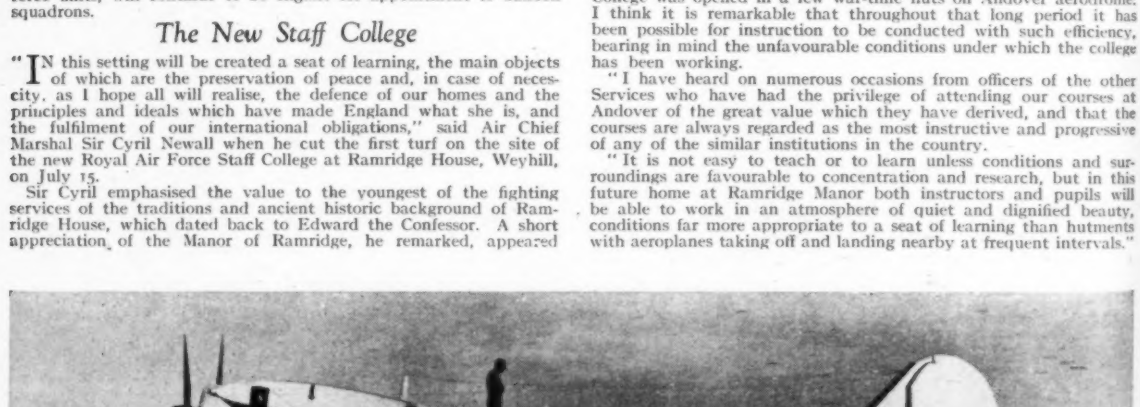
The place where he cut the first turf would be the site of the foundation stone of the new building, to be laid next year.

It was hoped that the new Staff College would be completed by the end of 1941, when it would bear worthy comparison with other public and Service buildings.

Reviewing the history of the present Staff College, Sir Cyril Newall said: "It is over 17 years since the Royal Air Force Staff College was opened in a few war-time huts on Andover aerodrome. I think it is remarkable that throughout that long period it has been possible for instruction to be conducted with such efficiency, bearing in mind the unfavourable conditions under which the college has been working.

"I have heard on numerous occasions from officers of the other Services who have had the privilege of attending our courses at Andover of the great value which they have derived, and that the courses are always regarded as the most instructive and progressive of any of the similar institutions in the country.

"It is not easy to teach or to learn unless conditions and surroundings are favourable to concentration and research, but in this future home at Ramridge Manor both instructors and pupils will be able to work in an atmosphere of quiet and dignified beauty, conditions far more appropriate to a seat of learning than hutments with aeroplanes taking off and landing nearby at frequent intervals."



WELCOME STRANGER: The American Consolidated 28-5 flying boat which has been acquired by the Air Ministry for experimental work and which was delivered by air last week. It is said to have a range, with a small military load, of over 4,000 miles. The stabilising floats retract outward and upward to form wing-tips.

UNIVERSITY SQUADRON ATTACHMENTS: On the left, members of the O.U.A.S., returning from an early morning flight at Lympne, pass colleagues at the wash-basin; in the centre, U.L.A.S. members are seen at Thorney Island; and on the right, C.U.A.S. pilots are seen chatting with Wing Cdr. Burns, the Commandant, at Duxford.

Balloon Squadron Promotions

IT will be gathered from this week's *Gazette* that the commanding officers of the first ten of the forty-seven balloon squadrons (Nos. 901 to 910) of the Auxiliary Air Force have been promoted to Wing Commander with seniority dated back to June 6. A number of these officers had war-time experience with balloons or airships.

Perseus in the Cold

NOW that large numbers of Bristol Perseus sleeve-valve engines are going into service in the Royal Air Force, the following particulars of winter service trials in Sweden with two Perseus XIs installed in Swedish-built Hawker Harts are of special interest.

It was found, state the makers, that the engines started readily, without preheating of any kind, in temperatures as low as minus 17° C. (30° F. of frost). The lowest temperature recorded during the trials was minus 20° C., and even under these very cold conditions no trouble was experienced, the air intakes and carburetters merely being warmed for a short while before starting to disperse ice and powdered snow which had accumulated when taxying-in from previous flights.

Both engines ran reliably and well throughout the tests. Purely for purposes of record, one engine was completely dismantled and closely examined after 115 hours of routine flying. The condition of the parts, it is reported, was so good that one of the officials remarked that the engine looked as though it had just completed its two hours' acceptance test rather than over a hundred hours of regular service in an aircraft.

The second engine was intentionally submitted to an unusually strenuous schedule of flight trials, and was dismantled after 250 hours to see how it had withstood this rough treatment. The examination was again stated to be highly satisfactory, a significant feature being the excellent condition of the big-end bearing bush, the pistons and the sleeve valves.

It is reported that the Swedish engineers in charge, after flying in these Perseus-engined Harts over a considerable area of Swedish Lapland where it is impossible to land except at specified places some hundreds of miles apart, were greatly impressed by the performance of the engines and their condition after the trials.

Fleet Air Arm: Advancement in the Flying Branch

THE following modifications of the standard rules for advancement in the Flying Branch have been approved as a temporary measure for those ratings who were transferred under a former Order:—

Ratings transferred from the Seaman, Signal or Telegraphist branches, who would have been advanced in substantive rating in their former branch before July 1, 1939, will be granted equivalent substantive advancement in the Flying Branch.

All ratings qualified for advancement in their former branch will be excused further qualification for the equivalent higher-rating in the Flying Branch.

The Air Gunner 2nd Class, qualification for advancement to Petty Officer Airman, and the service qualification (4 years) for advancement from Air Gunner 3rd Class to Air Gunner 2nd Class are waived. Examination for Air Gunner 2nd Class may be taken at any time after confirmation as Air Gunner 3rd Class.

Details of the professional examination for Leading Airman and for Petty Officer Airman will be issued at an early date.

Gilding the Lily

FLIGHT has previously complained against publication of optimistically inaccurate information regarding the ranges obtainable by current R.A.F. bombers. The performance figures for our new military machines are sufficiently high not to require "cooking," and it is difficult to understand the reason for the statement published on two consecutive days in a prominent "daily" (with a reputation for comparative accuracy) that the Bristol Blenheim Mark IV bomber has a range with full military load of 2,950 miles. The actual figure has been exaggerated by more than a third; the makers claim that a range of 1,900 miles is attainable, using all available tankage and employing 100-octane fuel for take-off.

It is further reported that the Vickers Wellington carries its full military load for 3,240 miles, whereas to attain this figure the Wellington must sacrifice a substantial part of its bomb stowage to extra tankage.

Flying Accidents

THE Air Ministry regrets to announce the following accidents:—

A.C.1 John Blythe Baxter lost his life and P/O. William Chapman Duncan was injured in an accident which occurred at Miranshah, India, on July 8, to an aircraft of No. 28 Squadron.

Sgt. David Horatio McCluckie Joseph is missing and believed to have lost his life as a result of an accident which occurred at Milford-on-Sea on July 9 to an aircraft of No. 3 Elementary and Reserve Flying Training School. Sgt. Joseph was flying solo.

2nd Lt. Nuri Muhsin, Royal Iraqi Air Force, lost his life as the result of an aircraft accident which occurred off Chesil Bank, Dorset, on July 12. 2nd Lt. Muhsin, who was attached to a Flying Training School, was flying solo.

Sgt. Jack Ogden lost his life and P/O. David Henry Bryan-Gower is missing and believed to have lost his life as the result of an aircraft accident which occurred at Tytam Bay, Hong Kong Island, on July 13.

P/O. Rodney James Bartholomew (flying solo) lost his life in an accident which occurred in Egypt on July 14 to an aircraft of No. 80 Squadron.

F/O. George William de Vinchelez Le Sueur (flying solo) lost his life in an accident which occurred near Abu Sueir, Egypt, on July 17.

Service Aviation

Royal Air Force Gazette

Air Ministry, July 11

Royal Air Force

General Duties Branch

G. S. Taylor is granted a permanent commission as Pilot Officer with effect from June 24, and with seniority of March 24, 1938.

The following (from Reserve) are granted short service commissions as Pilot Officers on probation for six years on the active list on the dates stated:—J. E. Marshall (June 23); A. C. Ennis (June 26).

G. K. Larney is granted a short service commission as Pilot Officer for five years on the active list (June 29).

The following are granted short service commissions as Acting Pilot Officers on probation for six years on the active list (June 24):—K. R. B. Ainsworth, J. W. E. Alexander, H. W. Allinson, R. P. Brayne, R. C. W. Broad, C. A. G. Clark, P. A. Clarke, A. C. Cochrane, L. W. Collingridge, R. P. Cross, M. B. Dawson, A. C. Denison, C. W. Doggett, A. F. Fenton, C. D. Francis, C. V. Fraser, G. F. Grant, G. H. Hackwood, W. E. C. Hagger, G. A. Hampton, K. G. Hart, M. W. Hartford, G. M. Head, G. L. Hickman, A. G. W. Hough, G. M. Howard-Jones, H. M. Jones, D. M. Lake, E. C. Lane-Sansam, D. F. Lenton, J. J. le Roux, P. A. Loweth, D. F. M. Mackarness, J. Mansel-Lewis, J. G. Masters, A. J. Mathew, J. F. M. Millar, P. H. G. Mitchell, I. C. Moorwood, S. B. Morris, P. Nixey, W. J. R. Redman, R. J. B. Roach, V. H. Rowan, K. Schadtler Law, D. O. Siddons, N. H. J. Smith, T. C. Stanbury, I. H. Stewart, J. H. Steyn, D. W. A. Stones, P. D. Strong, A. P. B. G. Sutton, E. Trumper, B. W. Vickers, J. M. Viney, C. S. Vos, R. H. Werner, P. A. Worrall.

The following are granted short service commissions as Acting Pilot Officers on probation for your years on the active list (June 24):—L. L. Bartley, M. A. Bentley, J. Benzie, C. S. Brocklebank, D. R. W. Brooks, J. M. V. Carpenter, J. C. T. Downey, L. E. Giles, W. Gilmour, W. H. C. Hunkin, B. A. James, W. G. M. Lambie, J. A. D. McLean, P. H. Neugebauer, P. W. Peters, G. R. Pushman, N. K. Stansfeld, P. V. K. Tripe, J. R. Urwin-Mann, A. T. Wheatley, A. G. Wright.

Flight Lieutenant C. R. J. Pink is promoted to the rank of Squadron Leader (June 1).

The following Flying Officers are promoted to the rank of Flight Lieutenant on the dates stated:—B. G. Carroll (Acting Flight Lt.) (April 14); B. E. Smith-Rewse, R. W. Reynolds, A. R. Atkins (Acting Flight Lt.), D. O. F. Lumsden, L. Mathias (June 14), C. F. King (Acting Flight Lt.) (June 19).

The following Pilot Officers are promoted to the rank of Flying Officer on the dates stated:—K. B. Corbould (February 24); W. H. Edwards (May 26); N. M. McElligott (June 12); D. F. Rixson, P. L. B. Morgan (June 16); G. H. D. Evans, P. G. St. G. O'Brian (Acting Flight Lt.), C. Bowen-Davies, F. D. Bird, R. H. de Montmorency, D. G. Stanley (June 18); J. A. D. Sturges, R. T. Hunn, J. R. Bland, J. H. Welford, J. A. Campbell, J. S. Davies (June 21); W. S. Barton (July 8).

Flying Officer C. G. Isacke is granted the acting rank of Flight Lieutenant (March 2); Flying Officer C. B. E. Burt-Andrews is granted the acting rank of Flight Lieutenant (unpaid) (May 15).

The following Flying Officers relinquish the acting rank of Flight Lieutenant on the dates stated:—S. W. B. Menaul (May 11); S. P. Coulson (May 22); G. F. Hall, B. P. King, K. J. Powell (June 12).

Flying Officer A. L. Bocking relinquishes the acting rank of Flight Lieutenant (May 20). (Substituted for notification in *Gazette* of June 23) Squadron Leader A. P. Maurice, D.F.C. (R.A.F. Ret.) is granted the honorary rank of Wing Commander (May 11).

COMMISSIONED ENGINEER OFFICER

Warrant Officer T. J. W. S. Pearce is granted a commission as Flying Officer on probation with effect from June 23 and with seniority of June 12.

COMMISSIONED SIGNALS OFFICERS

The following Warrant Officers are granted commissions as Flying Officers on probation with senority of June 12 and with effect from the dates stated:—A. J. Wild, A. C. Howell (June 23); A. S. C. Jukes (June 28).

COMMISSIONED ARMAMENT OFFICERS

The following Warrant Officers are granted commissions as Flying Officers on probation with effect from June 23 and with seniority of June 19:—J. McQ. Fitch, W. H. Jones.

ERRATUM

In the *Gazette* of June 30, for W. S. Reed, M.B.E., read W. S. Reed.

Royal Air Force Reserve

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

The following are granted commissions in Class CC in the ranks and on the dates stated:—Flight Lieutenants.—Lt. R. J. Findlay (April 10); Capt. H. M. Eldridge, M.C. (May 15); Lt. Count L. T. Boulderson di Balme (May 18). Flying Officer.—Lt. J. K. Watson (May 10).

Flying Officer R. M. Nobiston is promoted to the rank of Flight Lt. (June 27).

The following Flight Lieutenants are granted the rank of Squadron Leader on the dates stated:—G. I. C. Peacocke (May 12); J. G. Argles (May 13); S. A. D. Lane, E. J. Moule (May 22).

Flight Lieutenant B.D.S. Tuke (Flight Lt., R.A.F. Ret.) is granted the rank of Squadron Leader in Class CC (May 1); Flying Officer J. F. A. Baker is transferred from Class A to Class C (May 15); Flying Officer G. M. Adams is transferred from Class AA to Class C (December 17, 1938); Flight Lieutenant J. H. Leach relinquishes his commission on completion of service (February 28); Flying Officer J. G. Tait relinquishes his commission on completion of service (March 12) (substituted for notification in *Gazette* of May 19); Flying Officer J. G. Giddins relinquishes his commission on appointment to a commission in the Royal Air Force Volunteer Reserve (May 3).

The following Pilot Officers relinquish their commissions on appointment to short service commissions in the Royal Air Force on the dates stated:—J. E. Marshall (June 23); A. C. Ennis (June 26).

Equipment Branch

Flight Lieutenant R. W. Stewart (R.A.F. Ret.) is granted a commission in Class CC as Flight Lt. (May 12).

Erratum

In the *Gazette* of June 9, for Lt. G. T. Stoneham read Capt. G. T. Stoneham (T.A.R.O.).

Royal Air Force Volunteer Reserve

General Duties Branch

J. G. Giddins is granted a commission as Flying Officer with effect from May 3 and with seniority of September 16, 1932; Lt.-Col. F. B. Abbott, D.S.O. (I.A. Ret.) is appointed honorary Flight Lieutenant (May 15).

Administrative and Special Duties Branch

The following are granted commissions as Pilot Officers on probation with the honorary ranks stated (July 4):—Squadron Leaders.—H. S. Davies, H. Meredith, M.C., H. E. Smith. Flight Lieutenants.—J. W. L. Birkbeck, A.F.C., A. J. Harvey, L. G. Melio, J. R. Morgan, E. H. Otty, R. L. Saunders, W. J. Simons. Flying Officers.—F. Anderson, A. J. L. Collinson, E. G. Dunstan, J. C. Guthrie, R. C. Wagstaff, R. T. Wilkins.

The following are granted commissions as Pilot Officers on probation (July):—R. Alcock, A. E. R. Aldridge, C. H. Badderley, J. A. Baghino, J. H. Baird, E. P. L. Baker, R. I. P. Barker, St. A. C. Bartlett, C. A. B. Beattie, L. C. Belcher, R. R. Bentley, M.C., A.F.C., A. D. McC. Blair, M. W. Bovill, R. G. Bradbury, B. P. Broaces-Carter, D.F.C., D. L. Brocklesby, A.F.C., J. Brooker, J. H. Brown, E. R. Bullmore, S. W. M. Bunting, N. R. Butcher, C. W. Carleton, A.F.C., B. S. I. Champion, G. Colledge, E. E. Colquhoun, M.B.E., J. R. Colquhoun, L. P. D. Cooper, N. V. A. Crawford, G. H. Currall, M.M., A. A. Denison, M.B.E., M.C., E. B. Digby-Worsley, P. H. Dorte, J. A. Douglas, R. W. Drewett, C. S. W. Dudley, W. S. Eastaugh, D.F.C., S. J. Elliott, G. M. Emerson, F. E. Everard, F. C. Faulkner, W. S. Fielding-Johnson, M.C., R. M. Fletcher, V. J. Fontannaz, N. R. Fox-Andrews, L. M. Glover, F. W. Griffiths, F. J. B. Hammersley, S. E. Harvey-Barnes, H. Haycock, M.C., G. E. Hillman, A. L. Horrell, T. F. Hosking, A. R. Hungerford, E. W. Jeffreys, R. Johnstone, M.C., D. S. R. Kent, C. V. Kerpen, J. B. Knocker, A. Lewin, A. D. Loughborough, F. D. Lugard, A. J. Macnab, M.C., W. B. Mattinson, A. Maybaum, D. W. Meredith, G. A. Milbank, E. T. Mitchell, R. F. W. Moore, O. C. Morison, R. Munro, J. J. L. Patterson, H. S. Paynter, V. A. Peers, J. Phillips, Sir R. Pigot, Bart., D. W. Pinkney, M.B.E., M. F. Poulter, L. Rawnsley, H. W. Ray, G. Read, H. C. Reade, J. D. Rees, G. H. B. Richards, J. W. Richards, D. S. Richardson, W. Ridley, D.F.C., E. C. Rogers, K. Ruffe-Thomas, H. W. Scarnell, M.M., N. S. Sennett, W. H. Seward, J. A. Shaw, P. Sidney, R. J. Slade, A. C. Smith, G. J. E. Smith, G. M. Stephenson, S. W. Tinham, E. H. S. Tye, F. H. L. Varcoe, M.C., R. C. Vaughan, M.C., T. Waitt, J. A. D. Wallis, J. M. Watson, J. B. Weir, J. M. Welshman, A. E. White, W. E. M. Whittaker, A. A. Whorton, E. C. Willis, D.F.C., R. T. Wilson, C. Wise, H. H. Wood, G. L. Wright, D.S.M.

The notification in the *Gazette* of May 2 concerning D. W. Grinnell-Milne is cancelled.

Auxiliary Air Force

General Duties Branch

No. 602 (CITY OF GLASGOW) SQUADRON.—Pilot Officer Nigel Stuart Graeme is promoted to the rank of Flying Officer (April 29).

No. 4 BALLOON CENTRE.—Harry Reginald Francis Yorke is granted a commission as Pilot Officer (June 24).

No. 901 (COUNTY OF LONDON) SQUADRON.—Squadron Leader John Sylvester Wheelwright, D.S.C., is promoted to the rank of Wing Commander (June 6).

No. 902 (COUNTY OF LONDON) SQUADRON.—William Henry Powell is granted a commission as Acting Pilot Officer (June 5): Squadron Leader Philip Lionel Lincoln, D.S.O., M.C., is promoted to the rank of Wing Commander (June 6).

No. 903 (COUNTY OF LONDON) SQUADRON.—Squadron Leader George Middleton Haslam, T.D., is promoted to the rank of Wing Commander (June 6).

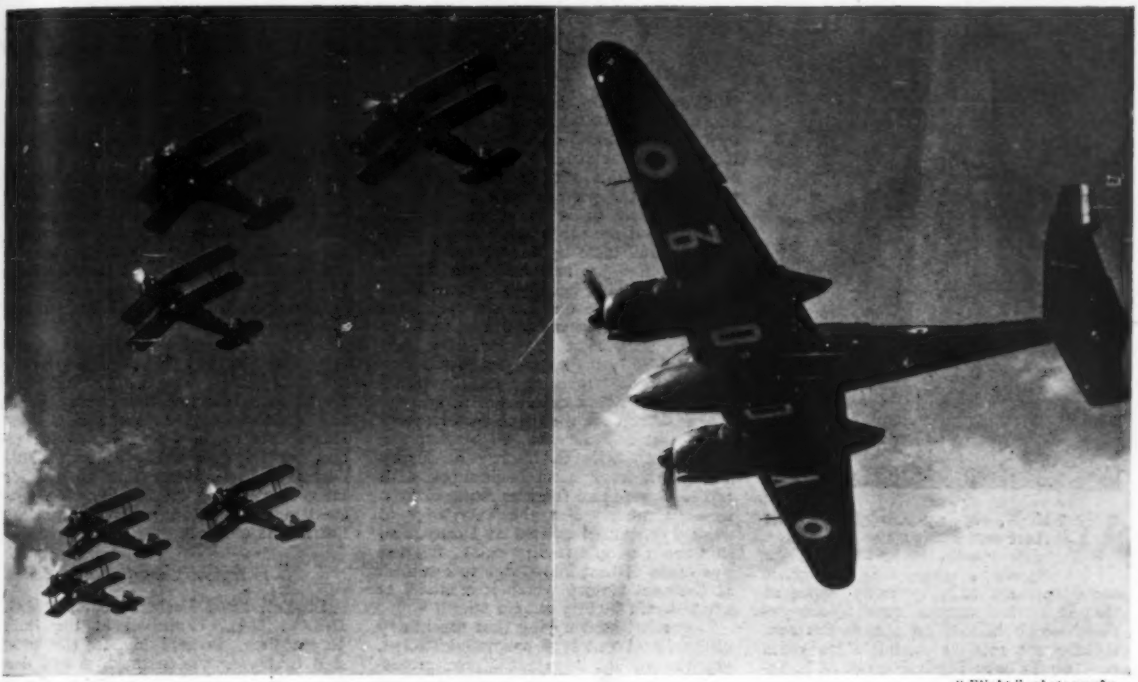
No. 904 (COUNTY OF SURREY) SQUADRON.—Squadron Leader Edgar John Davis is promoted to the rank of Wing Commander (June 6).

No. 905 (COUNTY OF SURREY) SQUADRON.—Squadron Leader William Guy Horne is promoted to the rank of Wing Commander (June 6); Flying Officer G. J. Scaramanga, D.F.C., relinquishes his commission (March 21).

No. 906 (COUNTY OF MIDDLESEX) SQUADRON.—G. E. Troughton Roberts is granted a commission as Acting Pilot Officer (June 13); Squadron Leader E. L. Gower, A.F.C., is promoted to the rank of Wing Commander (June 6).

No. 907 (COUNTY OF MIDDLESEX) SQUADRON.—P. L. W. Morton is granted a commission as Pilot Officer (May 25); Squadron Leader G. Aste is promoted to the rank of Wing Commander (June 6).

No. 908 (COUNTY OF ESSEX) SQUADRON.—The following are granted



"Flight" photographs.

ECHOS FROM EVERE : On the left are German Bucker Jungmeister aerobatic trainers of the unit which demonstrated at Evere, as recorded in *Flight* last week. The shapely monoplane is one of the three Breguet 690s of l'Armée de l'Air which shot up the aerodrome with such shattering effect.

commissions as Flying Officers on the dates stated:—R. W. Gaudie (May 23); R. H. Cale, M.C. (June 30).

Squadron Ldr. P. L. Dyson-Skinner is promoted to the rank of Wing Commander (June 6).

No. 909 (COUNTY OF ESSEX) SQUADRON.—The following are granted commissions as Flying Officers on the dates stated:—K. E. Parkes (May 5); H. Macfarlane (May 26); Squadron Leader D. A. J. Buxton is promoted to the rank of Wing Commander (June 6).

No. 910 (COUNTY OF ESSEX) SQUADRON.—Squadron Leader F. V. Drake, M.C., is promoted to the rank of Wing Commander (June 6).

No. 916 (COUNTY OF WARWICK) SQUADRON.—The Right Hon. A. N. Chamberlain, M.P., F.R.S., is appointed Honorary Air Commodore (July 8).

The following are granted commissions as Acting Pilot Officers on the dates stated:—W. Roper, D.F.M. (March 27); C. D. H. Macartney-Filgate (May 10).

No. 919 (WEST LANCASHIRE) SQUADRON.—The following are granted commissions as Pilot Officers on the dates stated:—G. M. A. Maxwell (May 18); A. J. Tavener (May 21).

No. 920 (WEST LANCASHIRE) SQUADRON.—The following are granted commissions in the ranks on the dates stated:—PILOT OFFICER.—H. S. Bailey (May 15). ACTING PILOT OFFICER.—H. B. N. Goodwin (June 16).

No. 921 (WEST LANCASHIRE) SQUADRON.—N. E. Williams, D.F.C., is granted a commission as Pilot Officer (June 7)

No. 922 (WEST LANCASHIRE) SQUADRON.—N. B. Thomson is granted a commission as Acting Pilot Officer (May 24); Flying Officer R. B. Dowling is transferred to No. 923 (West Lancashire) Squadron (May 17).

No. 923 (WEST LANCASHIRE) SQUADRON.—Flying Officer R. B. Dowling is promoted to the rank of Flight Lieutenant (May 17).

No. 925 (EAST LANCASHIRE) SQUADRON.—Maj. F. Robinson is granted a commission as Squadron Leader and appointed to the command of the squadron (May 13).

No. 926 (EAST LANCASHIRE) SQUADRON.—Capt. V. C. T. Lane is granted a commission as Squadron Leader and appointed to the command of the squadron (May 14); W. F. Scott is granted a commission as Acting Pilot Officer (May 20).

No. 927 (COUNTY OF GLOUCESTER) SQUADRON.—J. A. S. Williams is granted a commission as Acting Pilot Officer (June 19).

No. 928 (COUNTY OF GLOUCESTER) SQUADRON.—H. G. Webster is granted a commission as Acting Pilot Officer (June 17).

No. 929 (COUNTY OF GLOUCESTER) SQUADRON.—The following are granted commissions as Acting Pilot Officers on the dates stated:—W. J. W. Kettlewell, A. J. D. McArthur (June 10); A. L. R. Pearse (June 24).

No. 939 (WEST RIDING) SQUADRON.—Capt. W. M. Gibson, M.C., is granted a commission as Flight Lieutenant (April 19).

No. 941 (WEST RIDING) SQUADRON.—Maj. R. E. Wilson, M.C., is granted a commission as Squadron Leader and appointed to the command of the squadron (June 29).

The following are granted commissions as Pilot Officers (May 16):—A. J. B. Atkinson, A. L. Baker.

Accountant Branch

No. 908 (COUNTY OF ESSEX) SQUADRON.—G. Grayrigge is granted a commission as Pilot Officer (June 12).

Medical Branch

No. 613 (CITY OF MANCHESTER) SQUADRON.—B. P. Robinson, M.B., Ch.B., F.R.C.S., M.R.C.S., L.R.C.P., is granted a commission as Flying Officer (June 16).

No. 944 (EAST RIDING) SQUADRON.—R. J. H. Raines, M.B., Ch.B., M.R.C.S., L.R.C.P., is granted a commission as Flying Officer (May 23).

No. 945 (CITY OF GLASGOW) SQUADRON.—Capt. D. C. Buchanan, M.A., M.B., Ch.B., is granted a commission as Flight Lieutenant (May 9).

No. 947 (CITY OF GLASGOW) SQUADRON.—T. J. Rennie, M.B., Ch.B., is granted a commission as Flying Officer (May 25).

General List

Squadron Leader C. P. Gabriel, O.B.E., is promoted to the rank of Wing Commander (June 21).

Erratum

In the *Gazette* of June 23 for Edwig Cadwallader Roberts read Edwy Cadwallader Roberts.

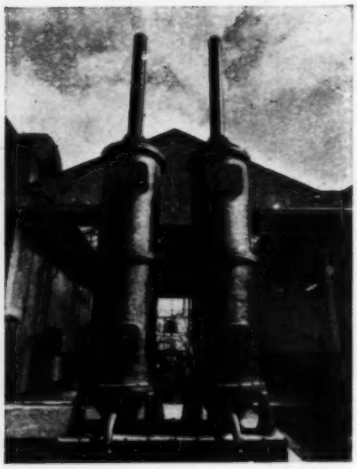
Just a Part . . .

EVERYONE knows the name of Austin Reed, and many are aware that the famous Regent Street firm of men's clothing specialists provide a comprehensive uniform service. What may not have been so generally realised—and this of particular interest to Royal Air Force officers—is that its geographical scope is equally wide.

Besides the Regent Street headquarters, there are uniform departments in Belfast, Birmingham, Bournemouth, Edinburgh, Glasgow, Leeds, Liverpool, Manchester and Norwich. And if none of these can be conveniently visited, a uniforms representative can call at any Mess—either in the course of his regular itinerary or by special appointment. This representative, it is stated, is an expert tailor, and he can take orders not only for Service kit but also for civilian clothes.

Austin Reed's guarantee the exact accordance with regulations of every uniform they make, and—which is just as important—the quality of the materials. Prices, however, are moderate, as will be seen from their R.A.F. booklet, a copy of which is obtainable from them at 103-113, Regent Street, London, W.1 (Regent 6789).

OUR GROWING AIR



WHEN, on July 6, 1938, the first turf was cut on the site of the new Rolls-Royce factory at Crewe, even the most optimistic could scarcely have seriously expected that in twelve months' time Merlin engines would be coming out of the new factory at a rate which, but a few years ago, would have been regarded as representing large output from any established works. Yet that is the achievement which now stands to the credit of the Rolls-Royce company, the Air Ministry, and the different contractors concerned in the enterprise.

The occasion was celebrated last Friday, when the Secretary of State for Air, Sir Kingsley Wood, paid a flying visit to Crewe and inspected the new factory which, in a speech at the luncheon which followed the inspection, he described as one of those new ones for which the Air Ministry had paid, but the management and operation of which was carried out by the firm. The price, by the way, Sir Kingsley put at about £1½ million. That sum, presumably, covers the whole factory. At the present time little more than one-half of it is completed and working, but the other half will probably be going full blast by the autumn.

To describe the new factory at Crewe adequately would occupy a greater number of pages than we have available this week, but it may be said quite briefly that, as was to be expected, it is laid out specifically for large-scale production on the most convenient lines. It is spacious, airy and clean, and in no part of the factory are the machines or operatives crowded in the slightest. The original Rolls-Royce factory at Derby has grown from small beginnings, with additions here and there as required from time to time. But the knowledge of what was wanted existed at Derby, and so when the opportunity came, full use was made of that knowledge to establish at Crewe a factory which is a model of what such a factory should be.

It goes without saying that machinery of the very latest type has been installed, and the lay-out is such that the procession of parts down the shops, from the materials stores through the various manufacturing sections and assembly departments to the final assembly of units into the finished Merlin engine, runs in orderly sequence and with a minimum of unproductive travel.

We were particularly impressed by the test-bed compound, which is so arranged that the engines under test are under roof but otherwise open to the air, while the control rooms in which the personnel works are enclosed and sound-proofed, and high walls between the compound and factory reduce the noise which reaches the shops almost to inaudibility.

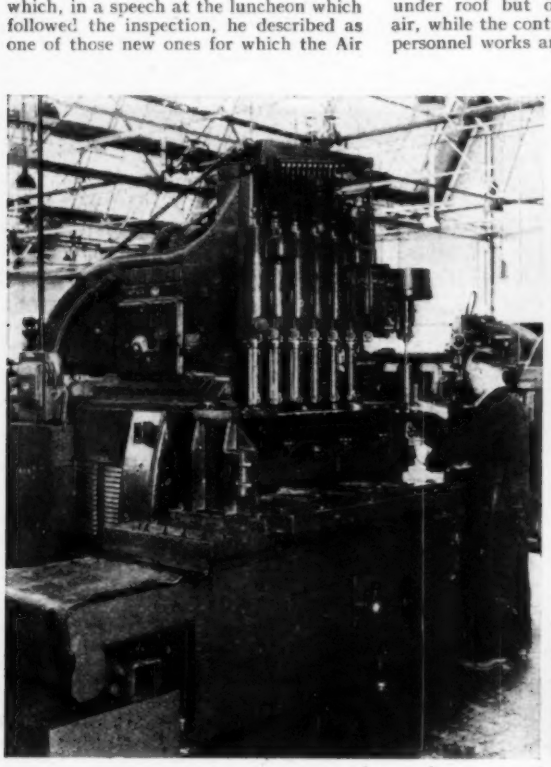
After test the engines are returned to the inspection department of the works for complete strip and examination before final reassembly and despatch. The photographs give a better idea of the magnitude and spaciousness of the new factory than can be given in words, especially as actual figures and dimensions may not be quoted.

At the luncheon in the new works offices Sir Kingsley Wood paid a tribute to the celerity with which the Rolls-Royce firm had got the factory going, and he also referred to the new Rolls-Royce factory in Glasgow. With the toast to the new works he coupled the names of Lord Herbert Scott and Mr. Hives, describing the latter as "a great asset not only to the Rolls-Royce firm but to the nation."

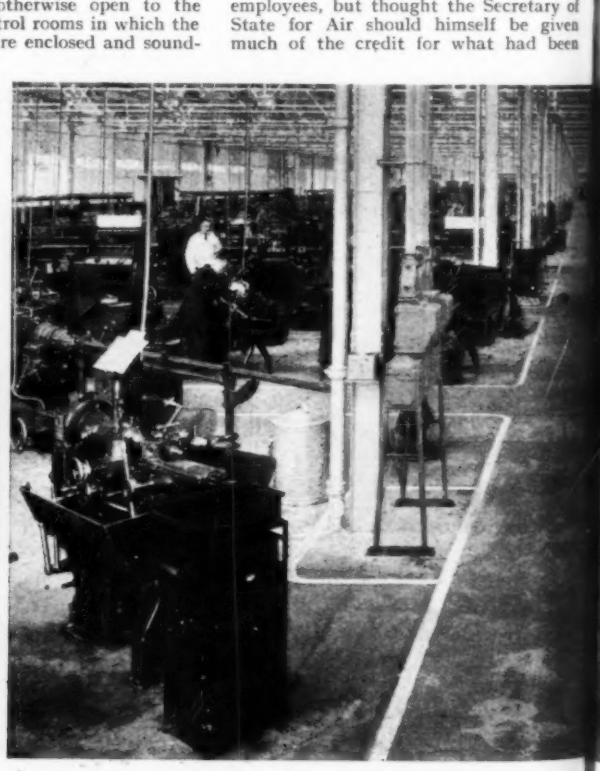
S.B.A.C. Co-operation

Lt.-Col. Lord Herbert Scott, C.M.G., D.S.O., D.L., chairman of the Rolls-Royce firm, in replying to the toast, said that everyone in the firm had done his utmost to fulfil the wishes of the Air Minister. He also thanked Mr. Handley Page, his chairman, Sir Charles Bruce Gardener, and the whole S.B.A.C. for the great help which the Rolls-Royce firm had received. He read a telegram of congratulations from the Lord Provost of Glasgow.

Mr. E. W. Hives thanked Sir Kingsley Wood on behalf of all the Rolls-Royce employees, but thought the Secretary of State for Air should himself be given much of the credit for what had been



Machining six combustion chambers simultaneously on a special six-spindle milling machine.



Far horizons : looking down the central gangway of the main machine shop.

AIRENGTH

Output by New Rolls-Royce Factory at Crewe Begins

The test bed compound is so arranged that the engines are under roof but otherwise open to the air. Exhaust is discharged into the large water coolers shown, and the control rooms are insulated against noise.

achieved. In meetings with Air Ministry officials Sir Kingsley Wood had been of great help in getting things done. Mr. Hives referred humorously to these meetings and said that some of the remarks made at them would, in other countries, have led straight to a concentration camp!

He recalled that the Rolls-Royce firm was the only company in the country which designed and produced their own aero engines during the last war. Those engines were not produced in model factories, as the last war was run on economical lines. But the experience did show the Rolls-Royce company that boot-makers and printing machine makers could do good work, and so when the demand came the firm merely had to repeat what was proved successful then. However, sub-contracting was not as simple as it looked. It was necessary to "take the sub-contractors into the family," and it was even necessary to persuade them that the A.I.D. was there to help, not to hinder production. Even "mods." were not so bad when one got used to them!

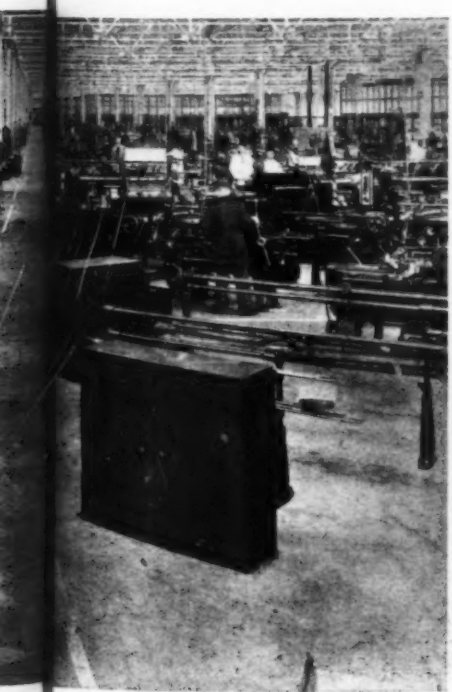
Mr. Hives told an amusing story of a firm of sub-contractors who, in the last war, were making some water pipes for the R.-R. Eagle engine. These pipes had ridges for the attachment of rubber connections and the ridges complicated manufacture. The firm in question, however, designed a little gadget for producing the ridges, and turned out the pipes at very low cost. So much so that the managing director thought they ought to tell Rolls-Royce that the price being paid was too high, and the sub-contractors were making too much money. He duly went to Derby, where he was kept waiting (as sub-contractors usually are) before being seen by a comparatively junior official. When he, somewhat nervously, began to say that he thought there was something wrong with the price of these pipes, he was told curtly that that was the price and that it would in no circumstances be altered! They were still waiting for one of their modern sub-contractors to come along with a similar offer.

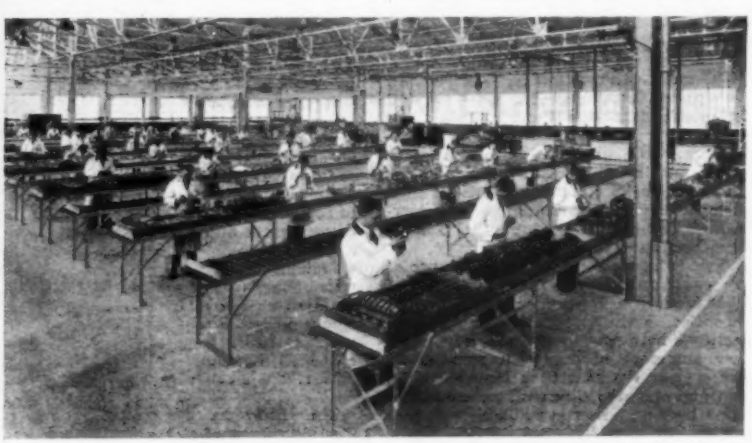
He also referred to Mr. Fedden and the Bristol company. In the last war Mr. Fedden's firm, Basil Straker, was the only one to make complete R.R. engines (Hawks), and the close co-operation then established was being maintained. The result of the work carried out at the laboratories of High Duty Alloys at Slough was being made available to the whole industry.

Mr. A. F. Sidgreaves, managing director of Rolls-Royce, Ltd., in proposing the toast of the guests, said that his firm had already spent £700,000 on the expansion, had put £250,000 into the Rotol Airscrew firm, and had invested £150,000 in the firm of Phillips and Powis, Ltd. With reference to the new R.-R. Glasgow factory he said that there would be no ceremony. Their motto was "no publicity in advance of achievement." The factory would be a good deal bigger than that at Crewe. He disliked the word "Shadow Factory," and pointed out that one dictionary definition of shadow was: "An imperfect and faint imitation of the original."

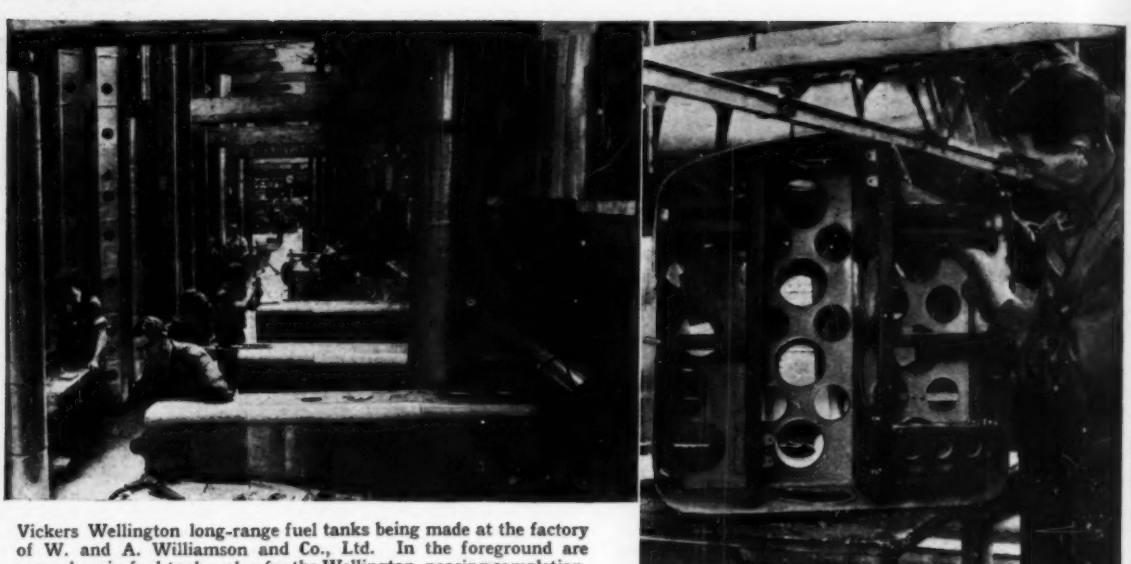
The party concluded with speeches by the Mayor of Crewe, who thanked the Rolls-Royce company for giving eminence to the town by building the new factory there, and promised to do all he could to help with housing, etc., and by Mr. F. Handley Page, who referred to the "directing mind" of Sir Kingsley Wood in carrying out the expansion programme.

Among the guests were many prominent Air Ministry officials, representatives of the S.B.A.C., a number of aircraft designers who use Rolls-Royce engines, and even a few representatives of "rival" engine concerns.





Engines are stripped and examined after test, special roller benches being used for carrying the trays containing the engine parts.



Vickers Wellington long-range fuel tanks being made at the factory of W. and A. Williamson and Co., Ltd. In the foreground are several main fuel tanks, also for the Wellington, nearing completion. On the right, a specialist is fitting a bearer during the course of assembly.

From Islington into Wellington

FOR more than twenty years the name of W. and A. Williamson and Co., Ltd., has been intimately connected with the sheet metal industry in its particular application to fuel and oil tanks. As specialists in this sphere it was only to be expected that the company would turn its attention to the production of aircraft tanks and several other components for well-known aircraft manufacturers.

Gradually it became more and more necessary to expand the works at Brewery Road, Islington, London, N.7, but, fortunately, it was possible to add extensions to the existing premises. By the end of last year the company's employees numbered over 250, but further big increases in orders made it necessary to take over other premises in the immediate vicinity, with the result that the number of employees on the pay-roll now borders on the 400 mark.

In the original works all the many components, such as bulkheads, baffles, stiffeners, brackets, valves, and ports, are produced on a quantity basis. Wherever possible drill jigs, made on the premises, are used. When each component has been double-checked and passed out it is then delivered to the stores in the adjacent new works, where all assembly is carried out.

Here we were greeted with the spectacle of a long shop filled to capacity with tanks of all shapes and in various stages of construction. At one end were organ-like stacks of long-range fuel tanks for the Vickers Wellington. This tank, incidentally, calls for special tackle, and a riveting machine recessed into the floor, owing to its unwieldy length. Other tanks being made were the Supermarine Spitfire, and spares for the Vickers Wellesleys.

Williamson and Co., Ltd., have a staff of qualified and approved welders specialising in various metals, while their plant includes modern hydraulically operated riveting machines (for the De Bergue process), presses, and spot-welding apparatus. Tanks produced are variously made under the De Bergue riveting process, welded and soldered. They also specialise in radiators, oil coolers, exhaust pipes, fairings, etc.

"Airscrews" Annual

SPEAKING at the ninth annual general meeting of the Airscrew Co., Ltd., Mr. J. D. Titler (chairman) said that it would be understood that for obvious reasons he was prevented from giving details of the extent of the company's airscrew business during the past year. However, the company continued to enjoy the prominent position which it had now held in the industry for a great many years, while its relationship with the Air Ministry remained as excellent as it had always been. Substantial further technical progress had been achieved, and their wooden blades for variable pitch airscrews were now as firmly and successfully established. The demand for these blades had been increasing steadily.

The business of the recently formed subsidiary, Jicwood, Ltd. (to manufacture wood with thermo-setting resins, compressed wood, and aircraft and commercial plywood), had been proceeding most satisfactorily.

The entry of the Airscrew Co. into the industrial ventilating fan market was also showing gratifying results.

Electrical Engraving

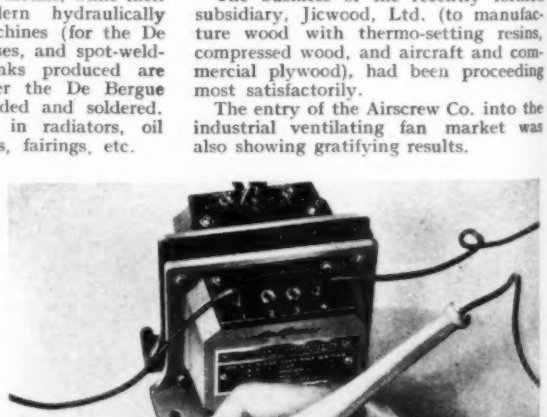
TO mark series numbers, trade marks, patent numbers, etc., on steel and other metal parts without risk of damage, all too frequently presents the manufacturer with an almost insurmountable problem. In many cases the metal is too hard to be stamped or, if it is of a delicate nature there is danger of distortion. Etching by acid may also have disadvantages.

One solution is provided by the use of an electric engraving pencil. A tool of this kind, the Makonus Electric Pencil, operates with a transformer on A.C. voltages between 200 and 260 volts. The low amperage necessary—it requires no more than a pocket flash lamp—enables it to be operated direct off an accumulator where no power is available.

The complete Makonus outfit includes the pencil, with plug and flex, a transformer with H.T. lead, a contact plate and three special heat-resisting tungsten alloy needles. The cost of this outfit is £3 3s., but where an accumulator set is required the cost is reduced to £1 11s. 6d.

In neither type of set is there any danger to the operator.

Makonus Electric Pencils are obtainable from Engineering Corporates, Ltd., 50, Pall Mall, London, S.W.1.



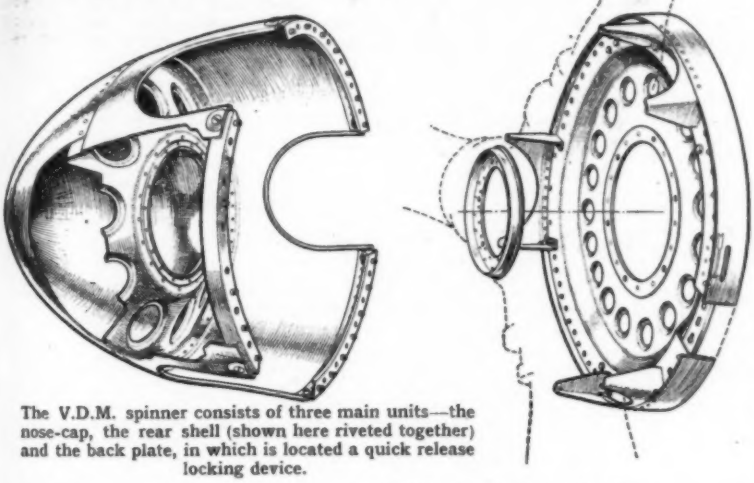
The Makonus outfit, with pencil, transformer and contact plate.

THE V.D.M. SPINNER

Large-scale Production of an Ingeniously Designed Component

PARTLY on account of the role which they played in the past, spinners have come to be looked upon as providing little more than a finishing touch to the lines of an aircraft. In recent years, however, speeds have increased so greatly that the spinner has become very much more than an ornament. Now, in fact, it plays a part absolutely vital to the performance of the modern high-efficiency machine.

The increasing use of constant-speed airscrews, high-octane fuels and reduced frontal areas has brought in its train a number of problems connected with cooling which, without the spinner, would become insoluble. Apart from reducing the head resistance of the airscrew hub, the correctly designed spinner can be made to improve the flow of air in the area around the blade roots of the airscrew and, most important of all, the flow over the crank case and cylinders of radials and into the air ducts of in-line engines.



The V.D.M. spinner consists of three main units—the nose-cap, the rear shell (shown here riveted together) and the back plate, in which is located a quick release locking device.

The importance of the role now played by spinners makes it possible to appreciate why it is that a company such as Constant-Speed Airscrews, Ltd., has set out to deal with the difficult problem of producing spinners on a big scale. This company has bought the British Empire sole licence for the manufacture of the quickly detachable V.D.M. spinner and, incidentally, the V.D.M. airscrew. Already large numbers of spinners have been made in the Company's works at Wharf Street, Warwick, and supplied for fitting to Rotol and De Havilland-Hamilton constant-speed airscrews on British military and civil aircraft.

During the course of a recent visit to the works of Constant-Speed Airscrews we were able to appreciate how complex such a simple-looking component as an airscrew spinner can be. Also, we were able to study the methods of production, which entail the employment of highly skilled craftsmen to practise a trade that is one of the few remaining crafts left in this world of machines and automatics.

Basically, the modern airscrew spinner must be strong enough to withstand extreme loadings; yet, because of its forward position on the thrust line of an aircraft, its weight must be reduced to an absolute minimum. The greatest accuracy has to be maintained throughout manufacture, while correct balance is, of course, essential; yet practically every main component is spun by hand and remains a tribute to the skill of the craftsmen who are able to work to the fine limits demanded.

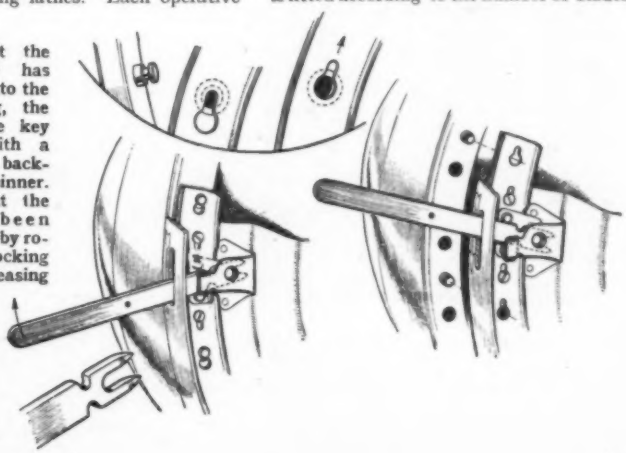
The V.D.M. spinner consists of three main units—the nose cap, the rear shell and the back plate. The last-named is bolted to the back of the airscrew hub. To the front of the hub is attached a support ring, so that when the rear shell and nose cap (which, incidentally, are riveted together to form one component) are brought up to the airscrew hub the support ring fits into a steel retaining ring situated in the centre of a special bulkhead. Studs in the flange or inner ring at the back of the rear shell fit into corresponding holes drilled in an ingenious locking ring attached to the back plate. To detach the spinner it is only necessary to use a key to rotate the locking ring and so release the studs of the rear shell, which can be drawn off the airscrew hub.

The nose cap is spun on specially designed spinning lathes. Each operative cuts his own chuck to templates and deals with batches of fifty at a time, using those heavy tools peculiar to the spinning trade. For the convenience of aircraft ground staff and mechanics, each nose-cap end or point is stamped out and fitted with a quickly detachable cap for handling an otherwise awkwardly shaped component. While it is fascinating to watch the operator spinning the nose cap it is even more so to see the way in which the rear shell is formed.

A V.D.M. spinner on the Miles Master.

This shell, in its finished form, gives the spinner the rigidity which is so essential. It is spun from one large circular disc of aluminium. In four drafting operations the disc first takes on a conical shape and then is turned back so that the conical face forms a bulkhead. The shell is then finished on a lignum vitæ chuck. The now inverted conical bulkhead is next lightened and strengthened by pressing out flanged holes. Its centre is jig-drilled (on an indexing table) for mounting a steel retaining ring, into which is fitted a fibre support ring. As has already been mentioned, this ring accurately fits over the support plate attached to the front of the airscrew hub, one of its objects being to absorb any undue vibrations which are transmitted from a deflecting backplate through the shell to this fibre ring.

Blade-root openings are next cut out of the rear shell and beaded-in with dural wire. Then an inner flanged ring (or, more correctly, segments of a ring) is fitted according to the number of blades



On the left the special key has been fitted into the locking ring, the jaws of the key engaging with a peg on the backplate of the spinner. On the right the key has been turned, thereby rotating the locking ring and releasing the grooved studs of the rear shell as indicated by the upper drawing.

for which the spinner is designed. These segments are drilled and cut in conjunction with the back plate and locking ring that are attached to the back of the airscrew hub. Special groove-necked studs or nipples are set in the flange of this ring, and mate with holes drilled in both the back plate and locking ring. Guide studs are also mounted in the back plate to engage with holes drilled in the flange of the inner ring. When the two components are brought together the special studs of the inner ring of the rear shell pass through the holes in the back plate and the locking ring. The latter is then turned by means of a special key, for the holes cut in this ring are key-holed in shape and secure the studs by their grooved necks.

By means of an ingenious looking device it is impossible to remove the key from the locking ring when the latter is in the unlocked position. The spinner is so designed that its direction of position rotation tends to turn the locking ring always towards the locked position.

It will be appreciated that the back plate of the spinner must be made to very accurate limits if the locking ring is to turn freely. The plate itself is spun and the lip is turned over to form a rim to which the fairing for the locking ring is riveted. Bracketed filler plates, which are riveted to the fairing ring and back plate, serve the dual purpose of imparting additional rigidity to the fairing ring and enclosing the area behind each blade root. Incidentally, most or the riveting work is carried out on special Gebrüder-Heller snap pressure riveting machines which make use of hollow punches.

The greatest accuracy is called for in mounting the steel ring in the back plate and the retaining fibre support ring in the bulkhead of the rear shell, for on the location of these two rings depends the accurate form of the spinner.

After final assembly the complete spinner is carefully weighed, balanced and checked. It is only at this stage that the wonderful craftmanship entailed in the manufacture of a V.D.M. spinner can be fully appreciated, for the tolerance permissible on this somewhat bulky component—from the tip of the nose to the back plate, the spinner is between three and four feet deep, according to the machine for which it is designed—is only 20/1000ths in. off centre at a point two inches in front of the rear shell.

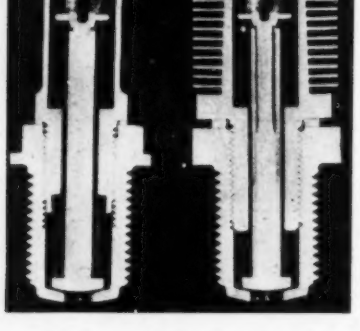
Transatlantic Sparking Plugs

The lot of a sparking plug manufacturer is not a simple one. Every type of engine has ignition peculiarities which call for a particular sparking plug. Apart from the more obvious aspects, such as compression ratios and engine speed, plug performance is also dependent on climatic and general operating conditions, engine cowling design and the grade of fuel used.

It is understandable, therefore, why the latest Bendix-Scintilla sparking plug catalogue lists so many types of plug. Nearly thirty widely different types are illustrated, tabulated and described in detail, with maintenance notes.

Many exclusive features are embodied in these plugs. Large section copper-sheathed electrodes of special steel assist in rapid heat dissipation, while an exceptionally low rate of electrode erosion is claimed on account of special materials and comparatively large areas. All the sparking plugs in the range are of the mica-insulated type.

Bendix-Scintilla sparking plugs are obtainable from the Bendix Aviation Corporation (Export Division), 30, Rockfeller Plaza, N.Y., U.S.A.



On the left is the latest Bendix 7 KLS sparking plug, while on the right is the cooler running Bendix B.5 AFLS type. Both types incorporate mica insulation, which runs the entire length of the copper-sheathed steel electrode and up the walls of the screen.

To Help Australian Production

MR. H. A. FRANCIS, for the last 16 years on the technical staff of Sir W. G. Armstrong Whitworth Aircraft, Ltd., is leaving this country early in August in order to take up the appointment of superintendent of the Aircraft Division with the Commonwealth Aircraft Corporation Pty., Ltd., at Fisherman's Bend, Melbourne.

Mr. Francis served in the R.F.C. and R.A.F. during the war, and afterwards he went to Cambridge and to the Royal Aircraft Establishment for two years. He originally joined Armstrong Whitworths as test pilot, and then was transferred to the technical department, of which he became chief. His many friends in the aircraft industry will join with us in wishing Mr. Francis every good fortune in Australia.

Cemented Carbide Tools

THE machining of present-day synthetic substances and alloys at very high speeds has played a big part in the introduction of cemented carbide tools. Many years of scientific research have been spent in connection with the evolution of this type of tool, particularly by the English Steel Corporation. This company has recently published an informative 64-page booklet dealing with the application of "Escalloy," which is a new type of sintered carbide alloy. Over 48 pages of the booklet are set aside for blue prints and dimension and price tables covering every conceivable type of tool to which "Escalloy" can be applied. Copies of the brochure are available to executives on application to the English Steel Corporation, Vickers Works, Sheffield.

NEW COMPANIES

In the notes below, for reasons of space, the "objects" of new companies are usually somewhat abbreviated.

COASTAL AIRCRAFT, LTD.—Capital £100. To manufacture, repair and deal in aircraft. Subscribers: R. K. Robertson (190, St. Vincent Street, Glasgow), A. A. Smith.

COBB-SLATER INSTRUMENT CO., LTD.—Capital £500. To manufacture, repair and deal in instruments and fittings for aircraft of all kinds. Directors: R. B. Cobb ("Runswick," Woolley Road, Matlock) and A. L. Slater.

WETTON AVIATION, LTD.—Capital £25,000. To conduct an aviation school and to manufacture and deal in aircraft, etc. Subscribers: W. H. Wetton, F. T. Wetton. Directors to be appointed. Registered office: St. Dunstan's Buildings, St. Dunstan's Hill, London, E.C.3.

S. SMITH AND SONS (CHELTENHAM, LTD.).—Public company. Nominal capital £100,000. To adopt an agreement with S. Smith and Sons (Motor Accessories), Ltd., and to manufacture aeronautical and other instruments, aircraft and motor accessories, etc. Directors to be appointed. Registered office: Cricklewood Works, London, N.W.2.

C. L. AIR SURVEYS, LTD.—Capital £1,000. To acquire the business carried on by C. Saint and J. Collier as "C.L. Air Surveys," and to carry on the business of air surveyors, photographers and carriers. Directors: C. St. J. Collier, C. Lloyd (Bush House, London, W.C.2).

AIRCRAFT ELEMENTS AND MACHINE TOOLS, LTD.—Capital £1,000. Engineers and manufacturers of aircraft of all kinds, steel and iron merchants, steel makers, etc. Directors: H. G. Ross-Dreher, W. Gee. Registered office: Willow Lane, Mitcham Common, Surrey.

SUPREME AIR SERVICES, LTD.—Capital £500. To operate air transport services. Subscribers: J. L. Bebb (Merseyside Air Park, Hooton, Cheshire), W. F. Griffiths.

AERONAUTICAL PATENTS

(Published July 20, 1939.)

25327. BENDIX AVIATION CORPORATION: Rate-of-climb indicators for aircraft and like rate of change of fluid-pressure responsive instruments (507,990).

25329. BENDIX AVIATION CORPORATION: Rate of change of pressure indicators such as rate of climb indicators in aircraft (507,992).

25330. BENDIX AVIATION CORPORATION: Rate of change of pressure indicating instruments such as rate-of-climb indicators for aircraft (507,992).

25331. BENDIX AVIATION CORPORATION: Rate of change of pressure responsive instruments such as rate-of-climb indicators for aircraft (507,993).

35253. BENDIX AVIATION CORPORATION: Timing mechanism in magneto generators (507,767).

35582. WARREN, N. H. and YOUNG, T. R.: Flying-machines (508,022).

35753. BRISTOL AEROPLANE CO., LTD., and FRISE, L. G.: Flotation gear for aircraft (508,033).

35767/1841. BOWER, C.: Controls for aircraft (508,085).

HENDERSON, A. J., FORECAST, C. A., and COATES, A. J. B.: Tanks and the like for carrying inflammable spirit on aircraft, ships, vehicles or the like (507,860).

1930. FAIREY AVIATION CO., LTD., and HILIG, L. M.: Lighting apparatus for use on aircraft and for like purposes (507,932).

14142. SPERRY GYROSCOPE CO., INC.: Electric earth induction compasses (507,965).

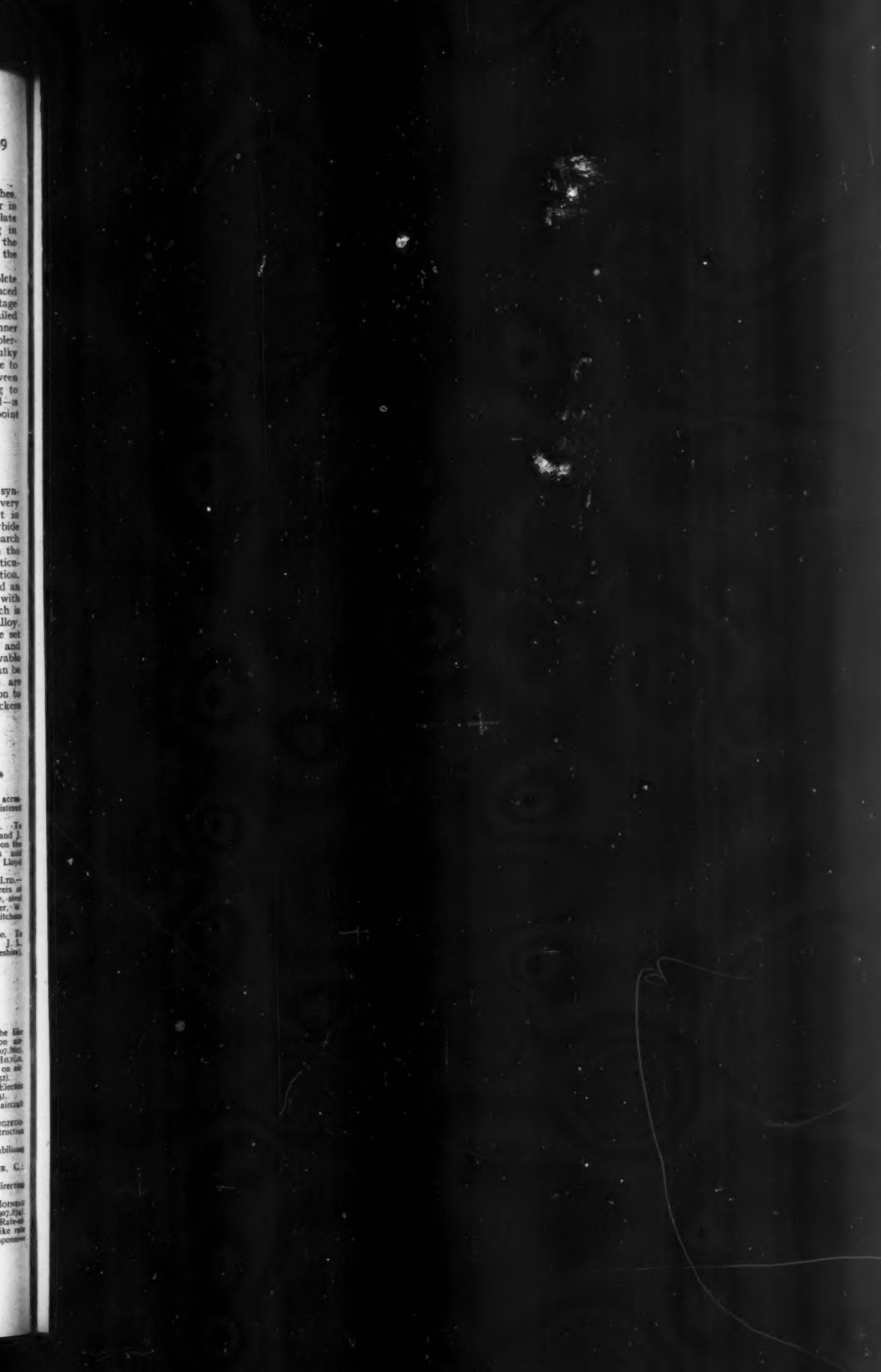
14493. SAUL, G. P. D.: Rotors for aircraft (507,701).

20070. ROHRBACH, A. K., and WESER FLUGZEUGBAU GES.: Aircraft wing construction (507,973).

21818. DORNIER-WERKE GES.: Aircraft stabilising float (507,713).

22831. DORNIER-WERKE GES., and DORNIER, C.: Aircraft (507,714).

24801. LORENZ AKT.-GES., C.: Radio-directive finding systems (508,054).

26971. SOC. D'EXPLOITATION DES BREVETS MOINEAU S.A.R.L.: Air- and water-craft (507,874).

16505. BENDIX AVIATION CORPORATION: Rate-of-climb indicators for aircraft and like rate of change of fluid pressure responsive indicating instruments (508,059).